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THIRTIETH

ANNUAL REPORT

OF THE

WATER COMMISSIONERS,

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COMMON COUNCIL OF THE CITY OF TROY,

FOR THE

FISCAL YEAR 1884.



TROY, N. Y.:

STOWELL PRINTING HOUSE, 5 CANNON PLACE.

1885.

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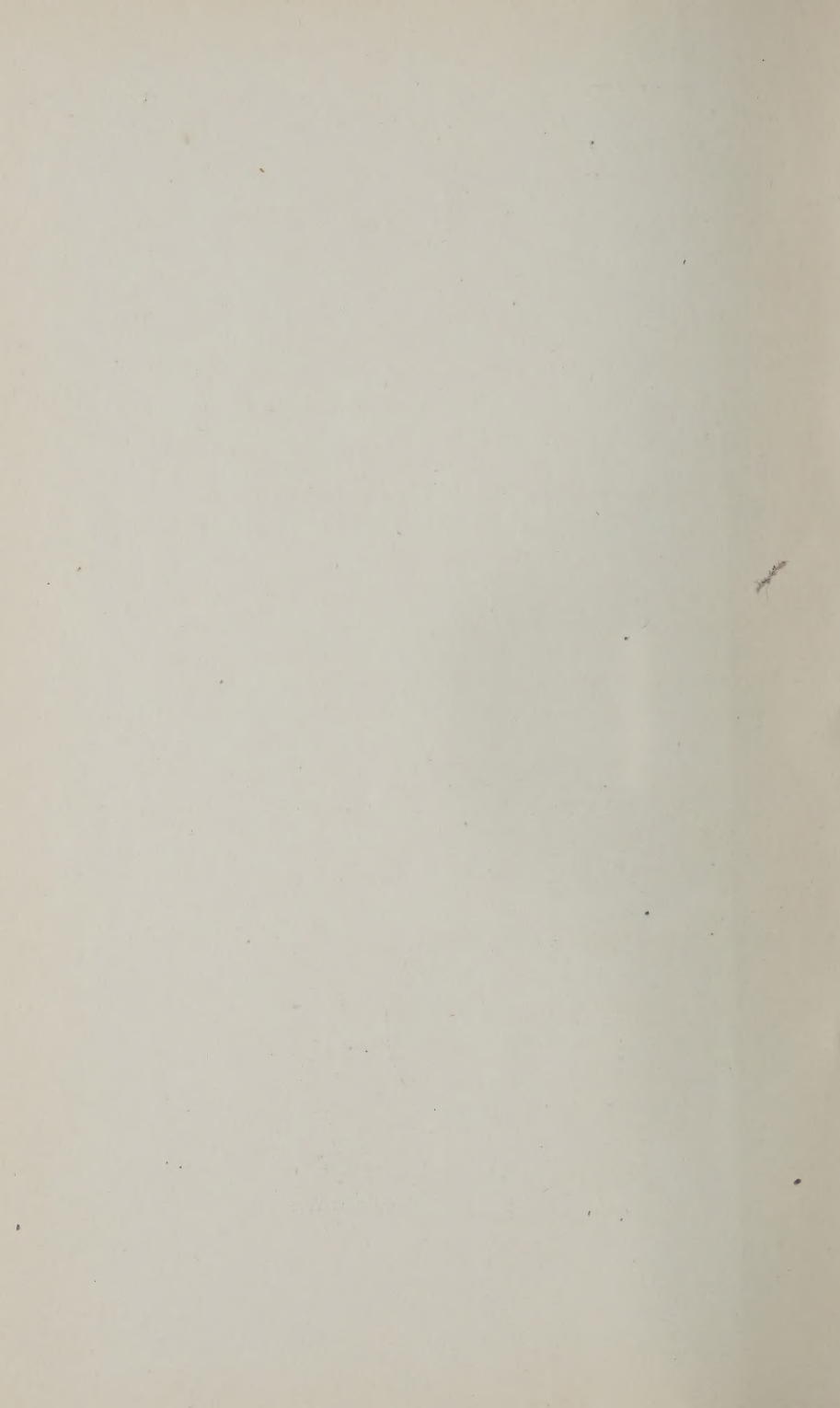
COMMON COUNCIL OF THE CITY OF TROY,

FOR THE

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TROY, N. Y.:
STOWELL PRINTING HOUSE, 5 CANNON PLACE.
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1884-5.

ORGANIZATION OF THE BOARD.

COMMISSIONERS:

RICHARD F. HALL, PRESIDENT.

JOSEPH FALES,

JOHN B. PIERSON,

LYMAN R. AVERY,

DAVID M. RANKEN.

Meetings First and Third Mondays each Month, at 7.30 P. M.

STANDING COMMITTEES:

| | |
|---|------------------------|
| Finance and Law, | PIERSON, FALES, HALL. |
| Pumping Station, Supplies and Repairs, . | RANKEN, AVERY, HALL. |
| Engagement of Help, and Discipline, . | AVERY, RANKEN, HALL. |
| Reservoirs, Lands, Water and Buildings, . | FALES, AVERY, HALL. |
| Mains, Hydrants and Extensions, . | HALL, PIERSON, RANKEN. |

JOHN G. OGDEN, CLERK.

WILLIAM M. BALDWIN, ASSISTANT.

EDWARD H. CHAPIN, SUPERINTENDENT.

PALMER H. BAERMANN, CHIEF ENGINEER.

AT PUMPING STATION, LANSINGBURGH:

SIFROID SOUCY, ENGINEER.

JOHN G. PRATT, ASSISTANT ENGINEER.

NAPOLEON BISSONNETTE, ASSISTANT ENGINEER.

KEEPER OF THE RESERVOIRS:

JOHN HARE.

REPORT.

To the Honorable the Common Council of the City of Troy :

GENTLEMEN :—We present herewith to your honorable body our Thirtieth Annual Report, being for the fiscal year 1884, terminating March 3, 1885.

The only change in the membership of the Board during the year was occasioned by the resignation of Henry S. Church on the 3d of April. The vacancy thus caused was filled by your honorable body in the election of David M. Ranken on the 6th of May. At the Pumping Station, in June, assistant engineer John Brooks having tendered his resignation was succeeded in that position by John G. Pratt, with Napoleon Bissonnette as second assistant. The services of D. M. Greene as chief engineer of this Department ceased on the 1st of February last. On the 2d of March, last, Palmer H. Baermann was appointed chief engineer of the Department.

A brief general statement of the financial condition of the Department is presented as follows :

| | |
|--|-------------------|
| Balance on hand March 4, 1884..... | \$ 15,907 57 |
| Proceeds Bonds sold (\$50,000)..... | \$50,575 00 |
| Regular water rents..... | 65,529 60 |
| For quit claim deed to F. N. Mann estate.. | 20 00 |
| Collected by the clerk..... | 16,152 74 |
| | <u>132,277 34</u> |
| Total resources for the year..... | \$148,184 91 |
| Paid for general maintenance..... | \$55,093 34 |
| “ for construction..... | 23,712 11 |
| “ for interest on debt..... | 16,062 50 |
| “ for sinking fund..... | 10,687 50 |
| | <u>105,555 45</u> |
| Showing balance on hand March 3, 1885..... | \$42,629 46 |

The balance here shown includes the old discrepancy of \$4,384.54 between the accounts of this Department and those of the chamberlain.

The past year was marked by a more bountiful supply of water from our gravity sources than had been known for several years past. Brunswick Lake filled on the 14th March, and Vanderheyden on the 27th. On the 28th all the lakes and reservoirs were entirely full and water running to waste. So large and steady was the flow that no pumping was done at Lansingburgh from the 11th March to 17th April, a period of 37 days, and the two lakes were still full on the 15th May.

The provision made at the new distributing reservoir for the discharge of waste or flood-water, namely, the large 30-inch waste pipe aided by the 12-inch pipe, and still further assisted by opening a valve on the 24-inch supply main below the dam, proved adequate on this occasion, in the absence of any accident from ice or other obstruction, to pass the water. Observations made at the time, however, and comparisons with the volume of other floods within the comparatively recent experience of the Department, showed conclusively that the waste outlets at this point were insufficient to meet the requirements of such floods as are quite possible at any time, and especially liable to occur in the freshets of early spring, and had, in fact, occurred before. In order therefore to make the waste outlets at this important point equal in capacity to the provision made for that purpose at all other points on the stream, and to avoid even the possibility of danger, it has been determined to construct an open waste way of the requisite capacity through the hillside adjoining the south end of the dam. The work will be done the coming summer.

The dam at this reservoir has required considerable labor and attention in order to put it in good condition. The leaks that appeared in it at the time of its completion and the letting on of the water continued throughout the following winter, varying more or less in extent, according to the height of water in the reservoir, but assuming such magni-

tude when the reservoir was full, that during the early months of the year, and in order to prevent the loss of water, it was found necessary to keep the pond down from 8 to 10 feet below the flow line. During this time ineffectual efforts were made to stop the leak from the water side by running straw and gravel into the holes that were visible in the embankment close to the north and west walls of the well house. Failing by these methods to accomplish the desired result, the water was lowered in the reservoir and excavations commenced between the wall of the dam and the well house. On reaching the 24-inch supply pipe, water was found percolating between the shelly slate on the sides of the rock cut and the puddle therein, and thence along the pipes and through the masonry wall. The cut-off walls were found to have settled somewhat on both sides of the 24-inch pipes passing through them—the settlement being due in part to the weight of the puddle on and over the walls, and in part to the want of adequate support below them. The middle portion of the walls directly over the pipes was duly supported by them, but on either side the wall, not having that support, had settled so far as to cause, on the lower quarters, openings in some instances of $1\frac{1}{2}$ inches between the pipe and brick work, through which the water readily passed. The results of the excavation thus far showed conclusively that the leakage from this imperfect joining of the natural and artificial work must extend considerably lower. Hence it became necessary to continue it to and below the 30-inch waste pipe some 23 feet below the top of the dam. At this point the principal cause of leakage was found to be due to the want of proper connection between the masonry wall and the rock, the wall being found in one instance to be started on the loose slate which the laborers removed without picking, and which on being taken out left a space of over two inches between the foot of the wall and the solid rock beneath it. A similar want of close work was found on one side of the 30-inch pipe, just above the centre of it, where the water found free passage through the wall. In the rear or lower side of the

dam there was still another leak, which was found to come from a fracture in the 24-inch supply main behind and close to the rear of the wall. The cause of this fracture is conjectural—being due either to a crack or defect in the pipe, or to the water-ram caused by the action of the air in the frequent opening and shutting of the valves in the well house, or possibly to both causes combined. The broken pipe was taken out and replaced with a new one. In making these repairs some portion of the puddle removed in the course of the work was found to be of inferior and unsuitable character. This was thrown out, and in restoring the work only the best material obtainable was employed. The surface of all rock sides was broken, so as to enable a close and secure joinage with the puddle. A masonry wall was built diagonally across and enclosing the 12 and 30-inch pipes and connected with the main cut-off wall, and every possible effort made both to stop the leaks and prevent a recurrence of them. The work, though entirely successful, was necessarily difficult and expensive, having cost for cement \$40.50, for team work \$174, for labor \$770.75, and for iron pipe and sleeve \$68, making a total cost of \$1,053.25. The only leak now noticeable is along the south foot of the embankment. It is probably due to filtration through the underlying slate rock, and consequently need not be a source of apprehension.

The high service reservoir received, last year, a very thorough grubbing and cleaning. It was not, in fact, properly and thoroughly grubbed out at the time of its construction in 1879, and with the subsequent alluvial deposits from the flow of the stream, it necessitated a considerable expenditure to put it in proper condition. The imperfect provision originally made for protecting the mouth of the 12-inch inlet pipe from the middle compartment was removed and a large and suitable copper screen set in place of it. The brick work of the well-house was also repaired. The cost of the screen and well-house repairs was \$40.88, cleaning and grubbing \$403.86, total \$444.74. The new bridge on the Brunswick Highway, crossing this reservoir

at its upper or eastern extremity, was placed there by the Brunswick Highway Commissioners. A claim of damages by the Brunswick authorities for injury to the old bridge, by the backing up of the water from the reservoir, was satisfactorily adjusted by the payment from this Board of two hundred dollars towards the building of the new bridge and allowing the Board to dictate some important features of its construction. As a result of this arrangement, the bridge was substantially constructed of stone, with a capacious waterway amply sufficient to take the stream at its highest pitch, and forms now a very useful and appropriate termination of the reservoir itself.

A very necessary work has been done in removing the wooden portion of the culvert by which the flood-water is passed from upper to lower Oakwood reservoir, and replacing it with a substantial structure of brick, with a circular waterway of six feet in diameter. It is in fact a continuation of the old brick culvert constructed in 1870 (which was about 144 feet in length), and extends from that point about 220 feet to lower Oakwood, where it terminates in a substantial head-wall built of Glens Falls limestone. The wooden portion of the old culvert was 14 years old, and had become, from various causes, a complete and useless wreck, the necessary result of which was to fill up to a considerable extent the eastern end of lower Oakwood reservoir with the wash from the earth beneath the bottom of the old culvert. While the pond was drawn down in order to lay the foundation of the head-wall, these deposits were removed and used in grading and filling over the new portion of the culvert. The total cost of the new culvert, including levelling, grading and the stone head-wall was \$2,399.12. The items of this expenditure will be found under their proper head in construction account.

The construction of a fence around that portion of the city property lying to the eastward of Oakwood Avenue, which was begun in 1882, was resumed last summer, and brought very nearly to completion, 7,935 feet of substantial

picket fence having been built at a cost of \$2,478.44; equal to about 31 $\frac{1}{4}$ cents per lineal foot.

The trestle-work of the coal run at the pumping-station, carried away by the ice in the early spring of 1884, was rebuilt soon afterwards, without any important deviation from the old plan; the only addition being a small wooden structure for the protection and accommodation of the hoisting-engine, and the engineer running it. The total cost of this repair was \$432.20.

Some necessary repairs, and a very considerable addition to the lodging capacity of the engineer's dwelling at the pumping-station, were made during the past summer at a total cost of \$668.14.

By deed dated February 1, 1882, the city purchased for water works purposes a certain plot of land on the north side of Ferry street. This deed included a narrow strip of land on the north side of the alley running east from Seventh street, between Ferry and Congress streets. This strip was about six feet in depth by forty-two feet on the alley. The estate of Judge Mann, deceased, from whom the lot was bought, discovered subsequently that the title to this strip was imperfect, and applied to this Department for a quitclaim deed of it. This was agreed to in consideration of the sum of twenty dollars, which amount has been duly received by this Department, and the transaction consummated by deed passed and approved by action of the Common Council.

On the 22d October last the woodwork of the well-house at upper Oakwood reservoir, and also the old dwelling-house, formerly occupied as a residence by the keeper of the reservoir, were destroyed by fire, involving a loss, as regards the well-house, of some two or three hundred dollars. The fire was carried by the wind from an outbuilding attached to the present residence of the keeper of the reservoir. It was doubtless of incendiary origin, and originated in this outbuilding, which was also totally destroyed. The well-house is now in course of repair. The old dwelling, only used as a storehouse, will not be rebuilt.

The winter just passed has been one of unusual and prolonged severity. The fact is noticeable here from its direct relation to the freezing and stoppage of the water supplying both house and hydrant laterals, an extraordinary number of such cases having occurred during the winter and caused very general inconvenience and expense; and this, too, notwithstanding the common and perhaps unavoidable practice on the part of consumers of letting their faucets run in order to prevent freezing. That our citizens have liberally availed themselves of this means of safety is shown to some extent by the extraordinary demands made upon our pumping machinery to keep the low-service distributing-reservoir full. To accomplish this the engines have been kept very steadily at work both night and day, delivering into the reservoir through the month of January an average of over five and three-quarter millions of gallons, and in February an average of nearly six and three-quarter millions daily. This large consumption of water, however, is not due exclusively to the cause above assigned, but also and probably in an equal if not greater degree to the fact that the increased pressure in the mains has developed new leaks and enlarged old ones in the laterals and water fixtures throughout the city generally. In addition to this the legitimate uses of water for manufacturing and other purposes have largely multiplied during the last few years, while during the same period we have also had to meet the demands of a growing population and an enlarged area of distribution. But, worst of all, and that which has created in the Department a feeling of the gravest apprehension, is the waste, the absolute and unnecessary waste, of water. Waste implies an outgo of money without any equivalent return for it. The full significance of this idea, in its connection with the water we use for our daily wants, is not, it is safe to say, very generally realized by our citizens, to whom, in fact, this wasted property belongs, and who, nevertheless, appear content, daily and hourly, to see their substance thus wasted and frittered away. It does not occur to them that every cup of water, small and insignificant as the quantity may be, has,

nevertheless, its own certain and ascertainable value in money—money expended in coal, labor and machinery, to place that cup of water where, at their option, they can use it or waste it; and money, too, which they themselves have actually paid out of their own pockets to this Department in order that they might have that privilege. For what else have our citizens been paying year after year, their annual water-tax? For what else did they last year pay into the hands of this Department the large sum of \$65,529.60? Surely, it was for the sole purpose that this gracious element might be supplied to them in the greatest abundance; in quantity fully adequate to meet not only the legitimate requirements of necessary or rational use, but also the largest demands of luxury and refinement. Such is the supposed object of the annual water-tax; but practically it has come to include both the means and the vicious privilege of wasting one's own property. That there should be some waste not due to ignorance and want of a just and proper comprehension of the subject is, of course, unavoidable. But whatever the cause or nature of the waste, it has now assumed proportions that are too great and too serious to pass longer unnoticed. That such is the case is shown more clearly and convincingly in the annexed report of the chief engineer, and it is the intention of the Board the coming year to institute measures more thorough than have hitherto been employed for the suppression of this needless and very expensive waste.

The facts here enumerated are only briefly alluded to; but it will be seen on reflection that each in its own line of thought affords abundant matter for careful and intelligent study; and that, taken generally, they are suggestive as indicating necessarily larger expenditures and also a gradual approach to the maximum capacity of our present pumping machinery; and as showing further the increasing magnitude of the operations of this branch of the public service. On the latter point, notwithstanding the full and comprehensive reports made annually and voluntarily by this Department for the information of the public, it is nevertheless

the common idea that "the water works" are now finished. If the public mind were more familiar with the subject than it is, it would readily be perceived that it is not in the nature of water works, as a whole, ever to be "finished," and that in our own exceptional and very complex situation, that part of our system which forms the low-service—the largest and most important of all—was "finished" so long ago that it is fast going to decay, and is now, and will be for years to come, in gradual course of reconstruction. A more clear and intelligent idea of the whole subject may perhaps be derived from a contrast between the present extent and capacity of our water works and that which obtained in the year 1855, when the present commission was created by act of the Legislature—an interval of thirty years.

At that time the city had a population of about 33,000. Its water works, such as they were, had then been in existence over twenty years, and had cost, up to that year inclusive, about \$175,000. The extent of pipe laid was 12 miles; number of fire-plugs, 85; stop-gates, 91. The assessed water-rents were \$15,324.60. There was but one storage reservoir, Brunswick Lake, and one distributing reservoir in addition to the fire-dam, with an aggregate capacity of three hundred and fifty-two millions gallons; and there was but one 12-inch supply pipe for the whole city, while the total daily supply of probably less than one million gallons was fully ample to meet the demands of that day. Such, at the time named, were the comparatively small and simple arrangements made for the water supply of the city.

During the short interval of only thirty years that has elapsed since that time the population of the city has increased to 60,000. The Board has had to supervise the additional expenditure, in construction alone, of the large sum of \$933,618.70. The extent of pipe laid has increased from 12 to over 48 miles; the fire-plugs from 85 to 516, aside from private plugs; and the stop-gates from 91 to 740. The assessed water rents have increased from \$15,000 to \$65,000; the storage, or reservoir capacity, from three hundred and fifty-two millions to six hundred and thirty-

three millions; the daily consumption from one to nine millions; and finally a large and expensive system of pumping by steam power from the Hudson River has been super-added to the original gravity supply in order to meet the growing demands of our larger population; concurrently with which, three separate services or systems of distribution have been arranged for different elevations as required by the topographical peculiarities of our city; the whole forming necessarily a very extended and somewhat complicated system of supply and distribution, covering an unusually large extent of territory and requiring for its proper oversight and management a corresponding force of employees available for service at any moment of the night or day; an equipment rendered all the more necessary by the fact that a large portion of what is known as the old or low service was constructed nearly fifty years ago, and is now not only inadequate in scope and deficient in strength for the present high pressure, but has become substantially worn out and unsafe from long years of service, and hence requires every year more or less of repair or absolute and total renewal. This is especially true of the old iron laterals, which are giving out almost daily and adding very largely to the expenses of the Department to replace them.

It should be evident from the foregoing that this Department, in the character and magnitude of its operations, and in the very nature of its duties and responsibilities, closely allied as they are to the interests and the immediate personal comfort and convenience of every citizen, has ample scope for the employment of its best energies and its wisest counsels. The contrast presented between the water works of 1855 and those of to-day, would, however, be imperfect without some reference to the fact that, aside from the question of personal or domestic convenience, the commercial or pecuniary interests now at stake and directly dependent on the water works and their management, are immeasurably greater to-day than they were then or even ten years ago. Within the past thirty years our city has made rapid strides in the domain of mechanical and manufacturing en-

terprise. On every hand we are surrounded by immense establishments in every possible line of business, whose very life-blood may be said to be drawn from the water works, and whose interests are immediately and often disastrously affected by the slightest derangement or stoppage of the supply.

It is in deference to these considerations that it has been determined, for the safety and better protection of the low service or that supplying the commercial part of the city, to bring down from the new distributing reservoir an additional 24-inch supply main. This service, it will be remembered, is now dependent for its supply upon one pipe only. The additional pipe will be brought down Turner's Lane to North Fourth street, where it will be suitably connected with the present distribution, thus affording an alternative means of supply in case of accident to the present main, and also enabling a proper and efficient connection to be made at that point with the force-main from the pumping station in Lansingburgh. This pipe will be laid on the opening of the coming season, but the very limited means at the disposal of the Department will not admit of its being carried at present further than North Fourth street. Eventually it will be carried towards the lower part of the city where by its increased volume it will probably to a considerable extent obviate in that locality the present loss of head by frictional resistance, and thus, as was originally intended, supply effectively the upper part of Mill street and its vicinity.

At the pumping station, under the constant personal attention and vigilant supervision of the Committee, aided by the intelligent co-operation of Mr. Soucy, the engineer in charge, affairs are now rapidly assuming a condition as regards both discipline and efficiency that bids fair to ensure results which there is little doubt will be very satisfactory, and which it has always been the aim and desire of the Board to attain. The task, aside from the expense incurred, has involved some responsibility and has been far from a light one. With regard to the engines it will not be con-

sidered surprising if a period of over four years of constant work has developed some imperfections both of workmanship and material. It has been the work of the Committee, at whatever necessary expenditure, to remedy and supply these deficiencies. * With regard to the boilers, the resetting of them, which had been under discussion by the Board for the past two years, was finally determined to be absolutely necessary on the ground of safety alone, the correctness of this decision being confirmed by the united testimony of practical mechanics and other competent and disinterested parties who had inspected the old setting and condemned it as unsafe and dangerous. After due consideration and examination of results attained in other localities the Jarvis setting was decided on and finally applied to the north battery of boilers. The work was completed in January. The results thus far accomplished are such as to fully justify the large expenditure, and are referred to with more particularity in the report of the chief engineer hereto annexed. To this report we refer your honorable body for all information concerning the operations of the pumping machinery and other matters of great interest to the public.

The payments for account of the pumping station made during the past year, as shown in the expenditure account, were as follows:

| | |
|-------------------------------------|--------------------|
| Pay roll, 12 months..... | \$ 7,106 95 |
| Coals..... | 11,835 80 |
| Repairs to boilers and engines..... | 8,477 27 |
| Oils and grease..... | 346 64 |
| Gas | 803 12 |
| Chief Engineer | 1,000 00 |
| Telephone | 88 03 |
| General supplies.....* | 845 18 |
| Total payments..... | <u>\$30,502 99</u> |

These figures are \$11,548.11 more than those of the expenditure account of the preceding year. But it will be remembered that the repair account includes not only general and extensive repairs to engines and boilers but also

the entire resetting of the north battery with the Jarvis patent, that the pay roll has been increased by the addition of one engineer and one fireman, that considerably more coal has been used and the gas bills more than doubled by incessant night work. The differences are as follows:

| | | |
|--|------------|--------------------|
| In coals..... | \$1,863 36 | |
| In gas | 568 82 | |
| In pay roll ... | 1,256 23 | |
| In repairs to boilers and engines..... | 7,770 27 | |
| | | <u>\$11,458 68</u> |

The aggregate of these differences is much more than offset by the extra expense of the new boiler setting and repairs to machinery and by the large increase in the amount of water pumped, namely, four hundred and fifty-one million gallons, which at the average cost of the years 1881-2-3 (\$14.60), is \$6,584.60. In fact the expenses aside from extraordinary repairs and in proportion to the work done are less than the previous year, as will appear from the engineer's report.

In October last negotiations were concluded for the purchase of a plot of land containing about two and a half acres on the north side of Summit avenue, bordering the south side of the new distributing reservoir and extending from Oakwood avenue westward about as far as the line of the new dam. The object of this purchase was to protect the new reservoir and the purity of its water by controlling the land on its south bank, and thus preventing the erection of dwellings and stables, vaults or other nuisance on lands whose natural drainage was directly into the reservoir. The price paid for the land was \$7,000. Deeds of this property from its respective owners to the city, have been prepared under the direction of the city attorney, and the transaction duly consummated by the payment of the consideration as above. It is to be regretted that this land was not purchased in 1883 concurrently with the building of the new distributing reservoir, when the necessity of its purchase was foreseen and recommended in whole or part by

the Committee to whom the question of the necessary land was referred. Unfortunately, however, under the pressure of financial and other considerations seeming at the moment to be of more immediate concern and importance, the matter failed to receive the attention it deserved, and the property meanwhile passing into the hands of private owners for building purposes, assumed a market value that could not be disregarded when the subject was again taken up and pressed upon the consideration of the Board.

The consumption of water by the different departments of the city, and which is supplied to them without charge, has now become very large and is deemed of sufficient importance to call for some consideration at the hands of the City Government. Nearly all the water used by the public buildings is supplied by the pumps at Lansingburgh, and at an actual cost of dollars and cents to this Department; thus largely increasing its own expenditures and proportionately decreasing those of the other departments by furnishing to them free of cost, an article of daily consumption which is as much a prime necessity of their existence as coal or gas. The case is well put in the language of the chief engineer of the Rochester Water Works in his Report of 1883, where he says, in substance, that there would seem to be a manifest injustice in thus compelling the water works to assist in maintaining the other departments and allowing them to take credit for economical administration at the expense of the water fund. It is obvious, under such circumstances, that no correct financial statement can be taken from the books of any of the Departments as to the actual cost of its maintenance, and that the Water Department, already heavily burdened with debt, is carrying also a load of very considerable magnitude that does not properly belong to it. The City Hall, three police stations, eight engine houses and thirteen school houses have all a supply of water which if charged and paid for at the usual and customary rates would represent a sum of not less than \$2,000. The fire plug use also, aside from the constant expense of repairing and renewing these

valuable adjuncts of the public service, is now very large. The justice and propriety of a fair allowance to the Water Department for such service is not entirely a new idea even here in Troy. It has been very generally discussed elsewhere, and in many places conceded and carried into practical effect. The whole matter is now respectfully brought to the attention of your honorable body, in the hope that it will receive the consideration it deserves, and that your honorable body will sanction and approve the necessary measures to obtain such legislative action as will give the desired relief by authorizing this Board to assess and collect from the various departments for the water used by them in accordance with the existing rates and charges and the rules and regulations of the Department, and by directing to be raised annually and passed to the credit of the water works fund the sum of ten dollars for each and every public fire plug in the city. The sum here named is small compared with that paid elsewhere. In a number of instances taken from statistical tables in the possession of this Department, where the water works, like our own, belong to and are operated by the city, the average rate credited was over \$30 for each fire plug; the lowest figure named being \$5; the highest \$84. The propriety as well as the need of some such special credit to this Department is obvious from the fact already referred to in this report, that water works, in the very nature of them, are never finished. They never reach the point of final completion. They are always in course of repair, alteration and extension. They have no surplus of means. They cannot have it. They need—and especially does this Department need—every dollar that can be fairly and legitimately asked for in order to carry out even a portion of the improvements and extensions now in contemplation and which are absolutely necessary both to the safety and the convenience of the city.

During the past year the following mains have been laid: In House avenue, from Ninth street eastwardly 336 feet, 6-inch; in St. John street, from Fourth street

eastwardly 428 feet, 6-inch; In River street, from junction with Second street main southwardly 285 feet, 12-inch, in place of an equal amount of old 6-inch pipe taken out; in Broadway, from connection in River street westwardly 200 feet 6-inch, with blow-off into sewer; in alley, between Second and Third streets, from Broadway to State street, 471 feet, 6-inch, in place of 460 feet old 2-inch taken out; in Linden avenue, from termination of main already there, westwardly to Marshall Infirmary 750 feet, 6-inch; in Locust avenue, from Pawling avenue westwardly 421 feet, 6-inch; in Prospect avenue, from Bank street southwardly 304 feet, 6-inch; in Seventeenth street, from Hoosick to Hutton street 950 feet, 6-inch; in Hutton street, from Seventeenth street westwardly 751 feet, 6-inch, to connection with main 38 feet east of Fourteenth street; in Sixteenth street, from Hutton street northwardly 248 feet, 6-inch; in Fifteenth street, from Jacob street to a point distant 148 feet north of Hutton, 948 feet, 6-inch; in Fourteenth street, from Hutton street northwardly 177 feet, 6-inch; in Eagle street, from Ninth street eastwardly 147 feet, 6-inch; in Eagle street, from Fifteenth street eastwardly 96 feet, 6-inch; in Jacob street, from Fourteenth to Sixteenth street 490 feet, 6-inch; in Cragin avenue, from Glen avenue to Park avenue 310 feet, 6-inch; in Park avenue, from Cragin avenue to North Fourth street 434 feet, 6-inch; in North Fourth street, from a point 50 feet north of Park avenue, southwardly 246 feet, 6-inch. Deducting from the aggregate of the foregoing, the pipe laid in place of old pipe, as stated, makes the actual increase in the area of distribution 7,191 feet, adding to which 358 feet of fire plug laterals, and deducting the old Knowles pump connection 56 feet 6-inch, now dropped out of the list, gives the total increase in the pipage of 7,549 feet. The aggregate length of all the pipe laid to date throughout the department is $48\frac{1814}{8280}$ miles. Thirty-one stop-gates and 21 fire plugs have been placed on new work. Seven stop-gates have been set in place of old ones removed, and 4

stop-gates have been placed where none were before. Five fire plugs have been set in place of old ones removed, and three fire plugs placed on old work where none were before. There are now in all 516 fire plugs, and 739 stop-gates. During the past year 267 house laterals have been put in, of which 176 were put in by this department and 91 by plumbers.

INCOME.

A DETAILED STATEMENT OF THE INCOME FOR THE YEAR
1884, ASIDE FROM BONDS SOLD, IS AS FOLLOWS :

From the annual assessed water rents collected with the
city taxes by the Chamberlain, viz :

| | | |
|---|-------------|-------------------|
| In First District..... | \$18,756 42 | |
| In Second District..... | 20,581 69 | |
| In Third District..... | 26,191 49 | |
| | <hr/> | \$65,529 60 |
| From amounts collected by the clerk and by him paid over to the Chamberlain, viz : | | |
| For use of water from fire plugs, sprinkling streets with wagons and small hose..... | \$2,303 14 | |
| For water used by county buildings, schools, churches and other buildings by special rates..... | 4,596 07 | |
| For water for masons' use..... | 84 53 | |
| For rent of house at distributing reservoir..... | 100 00 | |
| For ice..... | 290 40 | |
| For job work and sales of material..... | 8,778 60 | |
| For quit claim of land to Mann estate..... | 20 00 | |
| | <hr/> | \$16,172 74 |
| Total..... | | <hr/> \$81,702 34 |
| NOTE—Annual water rents 1884, as above..... | \$65,529 60 | |
| Annual water rents 1883 : | | |
| First District..... | \$18,453 88 | |
| Second District..... | 19,967 08 | |
| Third District..... | 25,287 58 | |
| | <hr/> | \$63,708 54 |
| Increase of rents over 1883..... | \$1,821 06 | |

The foregoing table indicates an increase of \$1,821.06 in
the amount of the regular water rents for 1884 as com-
pared with the amount for the preceding year.

The amount collected for street sprinkling and special
rates and masons' use is \$6,983.74, being an increase of
\$144.08 over the previous year's receipts from the same
source.

The total amount collected by the clerk is \$1,350.05 less than the amount collected in the previous year; the difference being due in part to the depression in general business, and in part to the falling off in the collections for masons' use.

EXPENDITURES.

THE ITEMS OF THE EXPENDITURE ACCOUNT FOR THE YEAR 1884, ARE AS FOLLOWS:

| | |
|--|------------|
| One year's interest and sinking fund payment to Nov. 1, 1884, on first issue of bonds..... | \$8,750 00 |
| One year's interest and sinking fund payment to Aug. 1, 1885, on second issue of bonds..... | 7,000 00 |
| One year's interest and sinking fund payment to April 1, 1885, on third issue of bonds..... | 7,000 00 |
| One year's interest to Aug. 1, 1885, on fourth issue of bonds..... | 1,750 00 |
| One year's interest to Nov. 1, 1884, on fifth issue of bonds, Three months' interest to Dec. 1, 1884, on sixth issue of bonds..... | 1,750 00 |
| | 500 00 |
| Pay roll (ordinary)..... | 16,343 95 |
| Pay roll (pumping station)..... | 7,106 95 |
| Lands purchased and taxes..... | 7,035 38 |
| Coals for pumping station..... | 11,835 80 |
| Repairs boilers and machinery, pumping station..... | 8,477 27 |
| Supplies, pumping station..... | 845 18 |
| Pumping station oils and grease..... | 346 64 |
| Gas at pumping station..... | 803 12 |
| Iron pipe..... | 6,104 66 |
| Stop gates and repairs..... | 1,028 84 |
| Plugs and repairs..... | 1,298 42 |
| Lead pipe..... | 1,505 15 |
| Iron castings..... | 1,483 28 |
| Brass goods..... | 842 12 |
| Wash hydrants and valves..... | 589 00 |
| Brick culvert at Oakwood..... | 1,242 87 |
| Shop supplies..... | 1,255 01 |
| New fence..... | 2,478 44 |
| Chief engineer's salary..... | 1,000 00 |
| Repairs engineer's dwelling, pumping station..... | 668 14 |
| Supplies for stable..... | 529 32 |
| Meters and repairs..... | 754 77 |
| Keeper of reservoir..... | 400 00 |

| | |
|--|---------------------|
| Damages paid..... | \$ 416 50 |
| Cartage..... | 357 26 |
| Blacksmithing..... | 189 60 |
| Material, repairs discharging reservoir..... | 280 46 |
| Printing and advertising..... | 309 83 |
| Rent barn five quarters..... | 232 50 |
| High service reservoir..... | 233 18 |
| Rebates taxes..... | 164 50 |
| Telephone..... | 264 10 |
| Superintendent's salary..... | 1,200 00 |
| Repairing coal run, pumping station..... | 432 20 |
| Stationery..... | 29 49 |
| Plumbing..... | 38 65 |
| Repairs dwelling, keeper reservoir..... | 63 35 |
| Contract trench excavation..... | 77 50 |
| Grading Oakwood ave. at reservoir..... | 96 00 |
| Lansingburgh H. R. R. commutation tickets..... | 40 50 |
| Coals for office..... | 111 91 |
| Cleaning rooms..... | 49 85 |
| Gas at office and shop..... | 69 57 |
| Gauge charts..... | 21 40 |
| Repairs roof pumping station building..... | 15 12 |
| Repairs office building..... | 19 57 |
| Postage, cards, &c..... | 26 60 |
| Expert examining clerk's books..... | 45 00 |
| Insurance office building..... | 12 50 |
| Printing bonds..... | 34 00 |
| Total..... | <u>\$105,555.45</u> |

A portion of the foregoing expenditures, having been for labor and material employed in the construction of new work, is chargeable to the general construction account, and is as follows:

FOR CONSTRUCTION.

| | |
|-----------------------------|----------|
| 12 feet 24-inch pipe..... | \$ 48 00 |
| 285 feet 12-inch pipe..... | 374 77 |
| 2 feet 8-inch pipe..... | 1 78 |
| 7,715 feet 6-inch pipe..... | 4,783 30 |
| 358 feet 4-inch pipe..... | 128 88 |
| 24 fire plugs..... | 840 00 |
| 1 16x6 tee..... | 25 41 |
| 2 12x4 tees..... | 28 06 |
| 2 8x4 tees..... | 14 00 |

| | |
|------------------------------|--------------------|
| 22 6x4 tees..... | \$ 126 50 |
| 1 12x8 cross..... | 18 56 |
| 1 8x6 cross..... | 10 50 |
| 8 6x6 crosses..... | 56 00 |
| 1 8 to 6 reducer..... | 7 00 |
| 1 6 to 4 reducer..... | 3 66 |
| 2 6-inch eighth bends..... | 6 42 |
| 2 6-inch quarter bends..... | 7 78 |
| 1 4-inch offset..... | 3 01 |
| 1 24-inch sleeve..... | 20 00 |
| 1 16-inch sleeve..... | 9 80 |
| 1 12-inch sleeve..... | 5 50 |
| 3 8-inch sleeves..... | 11 58 |
| 4 6-inch sleeves..... | 8 00 |
| 1 4-inch sleeve..... | 1 00 |
| 20 6-inch caps..... | 20 00 |
| 1 4-inch cap..... | 75 |
| 3 12-inch valves..... | 144 00 |
| 1 10-inch valve..... | 36 00 |
| 30 6-inch valves..... | 558 00 |
| 2 4-inch valves..... | 22 80 |
| 35 iron boxes..... | 271 25 |
| 7,834 pounds lead..... | 391 70 |
| 194 pounds yarn..... | 21 34 |
| 212 bushels coke..... | 16 96 |
| 2,107 days' labor..... | 3,160 25 |
| Blacksmithing..... | 36 60 |
| Contract excavation..... | 185 22 |
| Shifting laterals..... | 56 85 |
| Powder and fuse..... | 16 80 |
| 72,000 brick..... | 432 00 |
| 245 barrels cement..... | 318 70 |
| Stone for culvert..... | 187 92 |
| Dockage..... | 57 5 |
| Flap valve for culvert..... | 7 50 |
| Cartage and team work..... | 706 50 |
| Stencil plate for fence..... | 3 05 |
| Mason work..... | 695 06 |
| Hardware..... | 80 54 |
| Lumber..... | 1,629 25 |
| Carpenter work..... | 824 57 |
| Paints and painting..... | 256 11 |
| Lands and taxes..... | 7,035 38 |
| Total..... | <u>\$23,712 11</u> |

The character and location of the work done for construction account during the past year, and the distribution of the labor and material employed therein, and included in the foregoing statement, is indicated in the following detailed account thereof, viz:

DETAILS OF CONSTRUCTION.

| | |
|---|----------|
| Laying main in House avenue from centre of Ninth street eastwardly; 336 feet 6-inch pipe, 18 feet 4-inch pipe, one 6x6 cross on Ninth street, one 6x4 tee, two 6-inch caps, one fire plug, one 6-inch valve, one box, 214 pounds lead, 7 pounds yarn, 6 bushels coke, excavation (\$63.72), cartage (\$2.50) | \$369 07 |
| Laying main in St. John street from Fourth street eastwardly; 428 feet 6-inch pipe, 6 feet 4-inch pipe, one 16x6 tee on Fourth street main, one 16-inch sleeve, one 6x4 tee, one fire plug, one 6-inch cap, one 6-inch valve, one box, 400 pounds lead, 10 pounds yarn, cartage (\$2.50), coke and coal (\$.72), excavation (\$121.50)..... | 516 65 |
| Laying main in River street from junction with Second street southwardly in place of an equal amount of old 6-inch pipe removed; 285 feet 12-inch pipe, 6 feet 6-inch pipe, 28 feet 4-inch pipe, one 12-inch sleeve, one 6-inch sleeve, one 4-inch sleeve, one 12x8 cross, two 12x4 tees, one fire plug, three 12-inch valves, two iron boxes, 690 pounds lead, 15 pounds yarn, 10 bushels coke, 172 days' labor; cartage (\$5), shifting laterals (\$16.95)..... | 955 09 |
| Laying main in Broadway from junction with River street, westwardly to Front street; one 8 to 6 reducer, 200 feet 6-inch pipe, 17 feet 4-inch pipe, one 6-inch sleeve, one 6x6 cross at Mechanic street, two 6-inch caps, one 6-inch quarter bend for blow-off at Front street, one 6x4 tee, one fire plug, two 6-inch valves, two iron boxes, 194 pounds lead, 6 pounds yarn, 5 bushels coke, 35 days' labor, cartage (\$2.50)..... | 311 22 |
| Laying main in alley between Second and Third streets, from State street to Broadway; 471 feet 6-inch pipe, two 6-inch eighth bends, two 6-inch valves, two iron boxes, 419 pounds lead, 14 bushels coke, 10 pounds yarn, 104 days' labor, cartage (\$2), shifting laterals (\$39.90).... | 572 21 |
| Laying main in Linden avenue, from termination of main previously laid, westwardly to the Marshall Infirmary; | |

| | |
|--|----------|
| 750 feet 6-inch pipe, 20 feet 4-inch pipe, one 6-inch valve, iron box, two fire plugs, three 6x4 tees, one 4-inch cap, one 6-inch cap, 667 pounds lead, 16 pounds yarn, 18 bushels coke, cartage (\$7.50), blacksmithing (\$5.10), 103 days' labor, powder and fuse (\$16.80) | \$808 00 |
| Laying main in Locust avenue, from Pawling avenue westwardly; 421 feet 6-inch pipe, 20 feet 4-inch pipe, one 6-inch valve, one iron box, two fire-plugs, two 6x4 tees, one 6-inch cap, 392 pounds lead, 9 pounds yarn, 11 bushels coke, 60 days' labor, cartage (\$3)..... | 491 54 |
| Laying main in Prospect avenue, from Bank street southwardly; 304 feet 6-inch pipe, 8 feet 4-inch pipe, one 6-inch quarter bend at Bank street, one 6x4 tee, one fire plug, 288 pounds lead, 6 pounds yarn, 8 bushels coke, cartage (\$2.50), 37 days' labor | 309 70 |
| Laying main in Seventeenth street, from centre of Hoosic street southwardly to Hutton street; 950 feet 6-inch pipe, 21 feet 4-inch pipe, one fire plug, one 6x4 tee, two 6-inch valves, two iron boxes, one 6x6 cross at Hutton street, one 6-inch cap, 800 pounds lead, 20 pounds yarn, 24 bushels coke, cartage (\$7.50), 132 days' labor, blacksmithing (\$7.50) | 955 13 |
| Laying main in Hutton street, from centre of Seventeenth street westwardly to junction with main, 38 feet east of the centre of Fourteenth street; 751 feet 6-inch pipe, 54 feet 4-inch pipe, three fire plugs, three 6x4 tees, two 6x6 crosses, one 6-inch cap, five 6-inch valves, five iron boxes, 668 pounds lead, 16 pounds yarn, 19 bushels coke, cartage (\$5), 110 days' labor, blacksmithing (\$5)..... | 965 74 |
| Laying main in Sixteenth street from Hutton street northwardly; 248 feet 6-inch pipe, two 6-inch caps, one 6-inch valve, one iron box, 210 pounds lead, five pounds yarn, 10 bushel coke, cartage (\$2), 34 days' labor..... | 246 96 |
| Laying main in Fifteenth street from a point 148 feet north of Hutton street southwardly to Jacob street; 948 feet 6-inch pipe, 40 feet 4-inch pipe, five 6-inch valves, five iron boxes, two 6x4 tees, two fire plugs, two 6x6 crosses, two 6-inch caps, 860 pounds lead, 20 pounds yarn, 24 bushels coke, blacksmithing (\$5), 130 days' labor..... | 1,078 53 |
| Laying main in Fourteenth street from a point 45 feet north of centre of Hutton street northwardly; 177 feet 6-inch pipe, one 6-inch cap, 150 pounds lead, 4 pounds yarn, 4 bushels coke, 22 days' labor..... | 152 00 |

| | |
|--|----------|
| Laying main in Eagle street from centre of Fifteenth street eastwardly ; 96 feet 6-inch pipe, two 6-inch caps, one 6-inch valve, one iron box, 80 pounds lead, two pounds yarn, two bushels coke, cartage (\$1), 15 days' labor..... | \$115 75 |
| Laying main in Eagle street from Ninth street eastwardly ; 147 feet 6-inch pipe, one 6-inch cap, one 6-inch valve, one iron box, 120 pounds lead, four pounds yarn, three bushels coke, 17 days' labor, blacksmithing (\$3), cartage (\$2)..... | 155 67 |
| Laying main in Jacob street from centre of Fourteenth street to west line of Sixteenth street ; 490 feet 6-inch pipe, 12 feet 4-inch pipe, one 8x6 cross at Fourteenth street (renewal), one 6x4 tee, one fire plug, three 6-inch valves, three boxes, one 8-inch sleeve, one 6-inch sleeve, 446 pounds lead, 10 pounds yarn, 12 bushels coke, blacksmithing (\$5), cartage (\$3), 36 days' labor..... | 530 64 |
| Laying main in Cragin avenue from Glen avenue southwardly to Park avenue ; 310 feet 6-inch pipe, 24 feet 4-inch pipe, one 6x6 cross at Park avenue, one 6 to 4 reducer, two fire plugs, one 6x4 tee, one 4-inch offset, two 6-inch valves, two boxes, one 6-inch cap, 297 pounds lead, seven pounds yarn, eight bushels coke, blacksmithing (\$2), cartage (\$3), 30 days' labor..... | 410 22 |
| Laying main in Park avenue from Cragin avenue westwardly to North Fourth street ; 434 feet 6-inch pipe, 38 feet 4-inch pipe, two 6x4 tees, two fire plugs, two 6-inch valves, two boxes, 420 pounds lead, 10 pounds yarn, 11 bushels coke, blacksmithing (\$2), cartage (3), 41 days' labor..... | 506 44 |
| Laying main in North Fourth street from a point distant 50 feet north of centre of Park avenue southwardly ; 246 feet 6-inch pipe, 17 feet 4-inch pipe, one 6x4 tee, one fire plug, two 6-inch caps, one 6x4 tee at Park avenue, 234 pounds lead, five pounds yarn, six bushels coke, blacksmithing (\$2), cartage (\$2.50), 23 days' labor... .. | 258 87 |
| Placing fire plug on Ferry street, opposite No. 84 ; one fire plug, one 6x4 tee, one 6-inch sleeve, 17 feet 4-inch pipe, 2 feet 6-inch pipe, 78 pounds lead, 3 pounds yarn, 1 bushel coke, 5 days' labor..... | 61 92 |
| Placing fire plug on west side North Second street, opposite No. 99 ; one fire plug, one 6x4 tee, one 8-inch sleeve, 2 feet 8-inch pipe, 8 feet 4-inch pipe, 80 pounds lead, 3 pounds yarn, 2 bushels coke, 4 days' labor..... | 61 01 |

| | |
|---|--------------------|
| Placing fire plug on east side of North Second street, between Hoosick and Hutton streets ; one fire plug, one 8x4 tee, one 8-inch sleeve, 10 feet 4-inch pipe, 75 pounds lead, 2 pounds yarn, 2 bushels coke, 3 days' labor..... | \$58 09 |
| Building continuation of brick tunnel between upper and lower Oakwood reservoirs ; 72,000 brick, 214 barrels cement, stone for head-wall (\$187.92), dockage and unloading same (\$20.50), cartage, and cartage and use of derrick (\$37.00), team work (\$143.00), 120½ days' mason (\$482.00), 426 days' labor, wooden flap valve (\$7.50), grading and filling (\$172.00)..... | 2,399 12 |
| Placing valves where none were before—at Grand Division and Fourth streets, one 10-inch valve and one 4-inch valve on plug ; at Fourth and Liberty, one 4-inch valve on plug, 52 pounds lead, 4 days' labor, 4 pounds yarn, 3 bushels coke, 3 iron boxes..... | 91 33 |
| Building line fence east of Oakwood avenue ; 7,935 feet by contract (\$753.82), lumber (\$1,526.07), team work (\$140.00), nails and spikes (\$55.58), stencil plates (\$3.05) | 2,478 44 |
| Grading and filling in Oakwood avenue across and south of dam ; 24 days' team work..... | 96 00 |
| Land for protection of new distributing reservoir, including taxes thereon to date of purchase..... | 7,035 38 |
| Completing and enlarging capacity of engineer's dwelling at pumping station ; lumber (\$103.18,) sash and doors (\$70.75), tinsmith (\$25.04), mason work (\$213.06), painting (\$256.11)..... | 668 14 |
| Rebuilding portions of the new dam at distributing reservoir in order to make it secure ; 31 barrels cement (\$40.50), team work (\$174.00), 514 days' labor (\$770.75), iron pipe and sleeve, (\$68.00)..... | 1,053 25 |
| Total..... | <u>\$23,712 11</u> |

The following tables exhibit a comparative summary of the annual income of the water works for the last thirty years (being the period of its present organization), together with the expenditures of the department for the same time :

RECEIPTS.

| YEAR. | Sale of Bonds. | Assessed Rents payable to Chamberlain. | Paid to Chamberlain by Clerk. | Total Receipts. |
|-----------|----------------|--|-------------------------------|-----------------|
| 1855..... | | \$15,324 60 | \$ 5,520 94 | \$ 20,845 54 |
| 1856..... | | 16,005 57 | 5,169 16 | 21,174 73 |
| 1857..... | | 16,898 47 | 5,043 19 | 21 941 66 |
| 1858..... | | 17,131 11 | 4,770 66 | 21,901 77 |
| 1859..... | | 17,962 88 | 5,807 97 | 23,770 85 |
| 1860..... | | 18,479 61 | 4,122 90 | 22,602 51 |
| 1861..... | | 18,667 28 | 4,050 08 | 22,717 36 |
| 1862..... | | 16,696 93 | 7,784 70 | 24,481 63 |
| 1863..... | | 18,692 38 | 7,307 42 | 25,999 80 |
| 1864..... | | 20,117 12 | 6,925 76 | 27,042 88 |
| 1865..... | | 20,713 02 | 6,584 67 | 27,297 69 |
| 1866..... | | 21,958 13 | 7,684 03 | 29,642 16 |
| 1867..... | | 22,962 66 | 9,992 27 | 32,954 93 |
| 1868..... | | 25,162 50 | 13,958 26 | 39,120 76 |
| 1869..... | | 26,900 37 | 12,514 84 | 39,415 21 |
| 1870..... | | 28,619 47 | 10,272 16 | 38,891 63 |
| 1871..... | | 30,474 24 | 14,445 15 | 44,919 39 |
| 1872..... | | 32,906 84 | 12,010 66 | 44,917 50 |
| 1873..... | | 36,292 75 | 12,259 79 | 48,552 54 |
| 1874..... | | 38,192 06 | 9,584 59 | 47,776 65 |
| 1875..... | | 40,795 32 | 9,650 26 | 50,445 58 |
| 1876..... | | 43,007 20 | 8,491 94 | 51,499 14 |
| 1877..... | | 46,482 68 | 8,569 45 | 55,052 13 |
| 1878..... | | 47,791 32 | 6,911 00 | 54,702 32 |
| 1879..... | 203,153 00 | 48,383 10 | 9,720 68 | 261,256 78 |
| 1880..... | 100,000 00 | 56,922 25 | 17,552 10 | 174,474 35 |
| 1881..... | 50,000 00 | 61,273 00 | 18,336 44 | 129,609 44 |
| 1882..... | | 62,860 99 | 15,028 43 | 77,889 42 |
| 1883..... | 50,000 00 | 63,708 54 | 17,522 79 | 131,231 33 |
| 1884..... | 50,575 00 | 65,529 60 | 16,152 74 | 132,257 34 |
| 1884..... | ...Sale of | land to Es | tate F. N. Mann | 20 00 |
| | \$453,728 00 | \$996,911 99 | \$293,745 03 | \$1,744,405 02 |

EXPENDITURES.

| YEAR. | Interest and Sinking Fund. | Maintenance and ordinary Expenses. | Construction. | Total Expenditures. |
|-----------|----------------------------------|--|---------------|------------------------|
| 1855..... | \$ 5,000 00 | \$ 7,511 38 | ..... | \$ 12,511 38 |
| 1856..... | 5,012 50 | 7,112 09 | 8,868 69 | 20,993 28 |
| 1857..... | 4,761 87 | 7,216 99 | 11,855 08 | 23,833 94 |
| 1858..... | 4,511 69 | 6,345 67 | 11,484 69 | 22,342 05 |
| 1859..... | 4,510 69 | 7,630 62 | 8,783 43 | 20,924 74 |
| 1860..... | 4,059 06 | 7,459 35 | 10,140 80 | 21,659 21 |
| 1861..... | 3,582 88 | 7,016 65 | 15,864 65 | 26,464 18 |
| 1862..... | 3,558 88 | 8,625 40 | 15,652 10 | 27,836 38 |
| 1863..... | 3,308 25 | 10,280 97 | 9,615 55 | 23,204 77 |
| 1864..... | 3,057 62 | 10,330 92 | 5,907 61 | 19,296 15 |
| 1865..... | 3,057 63 | 11,534 71 | 1,107 04 | 15,699 38 |
| 1866..... | 3,050 00 | 13,098 70 | 1,720 52 | 17,869 22 |
| 1867..... | 2,550 00 | 12,491 79 | 14,761 55 | 29,803 34 |
| 1868..... | 2,550 00 | 20,783 48 | 25,942 79 | 49,276 27 |
| 1869..... | 2,300 00 | 11,704 45 | 29,856 48 | 43,860 93 |
| 1870..... | 2,050 00 | 13,999 46 | 46,181 24 | 62,230 70 |
| 1871..... | 2,500 00 | 23,852 22 | 8,822 69 | 35,174 91 |
| 1872..... | 1,900 00 | 18,583 06 | 10,071 75 | 30,554 81 |
| 1873..... | 1,750 00 | 21,544 24 | 11,015 67 | 34,309 91 |
| 1874..... | 1,750 00 | 16,428 09 | 31,726 01 | 49,904 10 |
| 1875..... | 1,375 00 | 22,881 36 | 31,315 63 | 55,571 99 |
| 1876..... | 1,000 00 | 16,922 16 | 7,347 43 | 25,269 59 |
| 1877..... | 1,000 00 | 21,357 36 | 16,888 22 | 39,245 58 |
| 1878..... | 1,000 00 | 29,273 76 | 48,866 58 | 79,140 34 |
| 1879..... | 14,500 00 | 8,868 40 | 280,774 21 | 304,142 61 |
| 1880..... | 23,500 00 | 39,290 99 | 86,521 75 | 149,312 74 |
| 1881..... | 24,750 00 | 41,646 13 | 35,863 78 | 102,259 91 |
| 1882..... | 24,750 00 | 32,315 96 | 17,619 22 | 74,685 18 |
| 1883..... | 25,625 00 | 46,832 84 | 106,384 68 | 178,842 52 |
| 1884..... | 26,750 00 | 55,093 34 | 23,712 11 | 105,555 45 |
| | \$209,071 07 | \$558,032 54 | \$934,671 95 | \$1,701,775 56 |

By deducting the total expenditures from the total receipts, as shown in the foregoing summary, it will be seen that the balance in the hands of the City Chamberlain at the end of the fiscal year 1884 was..... \$42,629 46

NOTE—The balance in the hands of the City Chamberlain at the end of the fiscal year 1883 was..... 15,907 57
Add total receipts for fiscal year 1884, as per foregoing summary..... 132,277 34

\$148,184 91

Deduct total expenditures for fiscal year 1884, as per foregoing summary..... \$105,555 45

Shows balance in the hands of the City Chamberlain, March 3, 1885, (as above) \$42,629 46

The figures in the foregoing table under the head of maintenance and ordinary expenses cover the transactions of twelve months. They also include the working expenses of the pumping station for the year. Deducting these expenses (\$30,502.99), from the gross amount as given in the tables, would show the sum of \$24,590.35 as representing the cost for 1884, of maintenance and ordinary expenses, aside from pumping. It should be remembered, however, that these figures always include the money value of iron pipe, lead and lead pipe, meters, iron castings, brass goods and other material bought and paid for during the year, but remaining in stock and not used in construction or job work, or repairs.

COST OF THE WATER WORKS.

| | |
|---|-----------------------|
| The total cost of the water works from 1833, when they were begun, to 1855, when the present board was organized, was, as near as can be ascertained..... | \$175,000 00 |
| Construction to date, March 1, 1885..... | 934,671 95 |
| Entire cost (March 1, 1885)..... | <u>\$1,109,671 95</u> |

DISPOSITION OF THE INCOME.

For the last thirty years the Common Council has annually appropriated all the surplus income of the water works for the extension and general improvement of the works. During that period the income has been disposed of as follows :

| | |
|---|------------------------------|
| For salaries, materials and maintenance..... | \$558,032 54 |
| For interest on debt { Old..... \$70,696 07 } { New..... 80,150 00 } | 150,846 07 |
| For payments to sinking fund..... | 58,225 00 |
| For construction..... | 934,671 95 |
| Unexpended balance in hands of Chamberlain..... | 42,629 46 |
| Total..... | <u><u>\$1,744,405 02</u></u> |

WATER WORKS DEBT.

The present debt of the City of Troy on account of its water works has grown entirely out of the enlargement and extension that was commenced in 1879, and is still in progress.

It is as follows :

- First*—A series of 100 coupon bonds of \$1,000 each, dated May 1, 1879, with interest payable semi-annually, at five per cent., and a provision for their payment at maturity by means of a sinking fund created by transferring annually to the commissioners of the funded debts of the City of Troy, out of the regular taxable water rents of the Department, the sum of \$4,000.00, and also an additional sum sufficient to pay the interest. Of this series the sum of \$10,000.00, maturing May 1, 1884, has been paid, leaving outstanding..... \$90,000 00
- Second*—A series of 105 coupon bonds, 95 of which are for \$1,000.00 each and 10 for \$500.00 each and dated August 1, 1879, with interest at $4\frac{1}{2}$ per cent., payable semi-

annually, and a provision for their payment at maturity by means of a sinking fund created by transferring annually to the commissioners of the funded debts of the City of Troy, out of the regular taxable water rents of the Department, the sum of \$7,000.00, a sufficient portion of which is to apply to the payment of the interest and the remainder to the payment of the principal; and this annual transfer of \$7,000.00 to the commissioners of the funded debts is to continue until the amount in the aggregate, with the accumulations added thereto, shall be sufficient to pay said bonds and the interest thereon, when such transfers shall cease to be made. Of this series, \$7,500.00 has been paid, leaving outstanding....

\$92,500 00

Third—A series of 20 coupon bonds of \$5,000.00 each, dated April 1, 1880, with interest payable semi-annually at $3\frac{1}{2}$ per cent., and a provision for their payment at maturity by means of a sinking fund created by transferring annually to the commissioners of the funded debts of the City of Troy, out of the regular taxable water rents of the Department, the sum of \$7,000.00, a sufficient portion of which is to pay the interest, and the remainder to pay the principal, and such annual transfer of \$7,000.00 to continue until the amount in the aggregate shall be sufficient to pay said bonds and the interest thereon, when such transfers shall cease to be made. Of this series, \$10,000.00 has been paid, leaving outstanding.....

\$90,000 00

Fourth—A series of 10 coupon bonds of \$5,000.00 each, dated August 1, 1881, with interest at $3\frac{1}{2}$ per cent., payable semi-annually, and a provision for their payment by means of a sinking fund created by transferring annually out of the taxable water rents of the Department, to the commissioners of the funded debts of the City of Troy, for the use of said City, a sum sufficient in the aggregate to pay the interest of said bonds, and also the principal thereof at such dates and times respectively as the said principal and interest shall become due and payable; and such payments to be continued annually until the aggregate amount thereof shall be sufficient to pay and discharge the said bonds and interest in full, as above provided.....

\$50,000 00

Fifth—A series of 10 coupon bonds of \$5,000 00 each, dated May 1, 1883, with interest at $3\frac{1}{2}$ per cent., payable semi-annually, and a provision for the payment of the

principal and interest thereof, out of the taxable water rents of the department at such times and in such amounts as the said principal and interest shall become due and payable; and such payments to be continued until all such bonds and interest shall be duly paid.

The first bond of this series matures May 1, 1910, and the remainder at intervals of one year thereafter.....

\$50,000 00

Sixth—A series of 6 coupon bonds, two thereof for \$500 00 each, and 4 thereof for \$10,000 00 each, dated June 2, 1884, with interest at 4 per cent., payable semi-annually, and a provision for the payment of the principal and interest thereof out of the taxable water rents of the department at such times and in such amounts as the said principal and interest shall become due and payable; and such payments to be continued until all such bonds and interest shall be duly paid.....

\$50,000 00

Total debt at date..... \$422,500 00

The payments made during the past year on account of the above indebtedness, and in accordance with the stipulated conditions of issue, were as follows :

On the first issue (May 1879), 6 months'

interest to 1 May on \$100,000, at 5 per

cent.....\$2,500 00

Six months' interest to 1 November, 1884,

on \$90,000 at 5 per cent. 2,250 00

\$4,750 00

Annual sinking fund payment thereon..

4,000 00

\$8,750 00

On the second issue (August, 1879), one year's

interest to August 1, 1885, on \$92,500 at

4½ per cent..... \$4,162 50

Annual sinking fund payment thereon..... 2,837 50

7,000 00

On the third issue (April, 1880), one year's inter-

est to April 1, 1885, on \$90 000 at 3½ per

cent..... \$3,150 00

Annual sinking fund payment thereon..... 3,850 00

7,000 00

On the fourth issue (August, 1881), one year's interest to

August 1, 1885, on \$50,000 at 3½ per cent.....

1,750 00

On the fifth issue (May, 1883), one year's interest to Nov-

ember 1, 1884, on \$50,000 at 3½ per cent.....

1,750 00

On the sixth issue (June, 1884), 3 months' interest to Dec.

1, 1884, on \$50,000 at 4 per cent.....

500 00

Total payments..... \$26,750 00

TABLE OF INDEBTEDNESS.

| Date of Issue. | Series. | Rate of Interest. | Date of Maturities in the order of time. | Amount Maturing at dates named. |
|----------------|---------|-------------------|--|---------------------------------|
| April 1, 1880 | 3d | 3½ | April 1, 1885 | \$ 5,000 00 |
| April 1, 1880 | 3d | 3½ | April 1, 1886 | 5,000 00 |
| May 1, 1879 | 1st | 5 | May 1, 1886 | 10,000 00 |
| August 1, 1879 | 2d | 4½ | August 1, 1886 | 7,500 00 |
| April 1, 1880 | 3d | 3½ | April 1, 1887 | 5,000 00 |
| May 1, 1879 | 1st | 5 | May 1, 1888 | 10,000 00 |
| April 1, 1880 | 3d | 3½ | April 1, 1889 | 5,000 00 |
| August 1, 1879 | 2d | 4½ | August 1, 1889 | 7,500 00 |
| April 1, 1880 | 3d | 3½ | April 1, 1890 | 5,000 00 |
| May 1, 1879 | 1st | 5 | May 1, 1890 | 10,000 00 |
| April 1, 1880 | 3d | 3½ | April 1, 1891 | 5,000 00 |
| August 1, 1881 | 4th | 3½ | August 1, 1891 | 5,000 00 |
| April 1, 1880 | 3d | 3½ | April 1, 1892 | 5,000 00 |
| May 1, 1879 | 1st | 5 | May 1, 1892 | 10,000 00 |
| August 1, 1879 | 2d | 4½ | August 1, 1892 | 7,500 00 |
| August 1, 1881 | 4th | 3½ | August 1, 1892 | 5,000 00 |
| April 1, 1880 | 3d | 3½ | April 1, 1893 | 5,000 00 |
| August 1, 1881 | 4th | 3½ | August 1, 1893 | 5,000 00 |
| April 1, 1880 | 3d | 3½ | April 1, 1894 | 5,000 00 |
| May 1, 1879 | 1st | 5 | May 1, 1894 | 10,000 00 |
| August 1, 1871 | 4th | 3½ | August 1, 1894 | 5,000 00 |
| April 1, 1880 | 3d | 3½ | April 1, 1895 | 5,000 00 |
| August 1, 1879 | 2d | 4½ | August 1, 1895 | 7,500 00 |
| August 1, 1881 | 4th | 3½ | August 1, 1895 | 5,000 00 |
| April 1, 1880 | 3d | 3½ | April 1, 1896 | 5,000 00 |
| May 1, 1879 | 1st | 5 | May 1, 1896 | 10,000 00 |
| August 1, 1881 | 4th | 3½ | August 1, 1896 | 5,000 00 |
| April 1, 1880 | 3d | 3½ | April 1, 1897 | 5,000 00 |
| August 1, 1881 | 4th | 3½ | August 1, 1897 | 5,000 00 |
| April 1, 1880 | 3d | 3½ | April 1, 1898 | 5,000 00 |
| May 1, 1879 | 1st | 5 | May 1, 1898 | 10,000 00 |
| August 1, 1879 | 2d | 4½ | August 1, 1898 | 7,500 00 |
| August 1, 1881 | 4th | 3½ | August 1, 1898 | 5,000 00 |
| April 1, 1880 | 3d | 3½ | April 1, 1899 | 5,000 00 |
| August 1, 1881 | 4th | 3½ | August 1, 1899 | 5,000 00 |
| April 1, 1880 | 3d | 3½ | April 1, 1900 | 5,000 00 |
| May 1, 1879 | 1st | 5 | May 1, 1900 | 10,000 00 |
| August 1, 1881 | 4th | 3½ | August 1, 1900 | 5,000 00 |
| April 1, 1880 | 3d | 3½ | April 1, 1901 | \$ 5,000 00 |
| August 1, 1879 | 2d | 4½ | August 1, 1901 | 7,500 00 |

TABLE OF INDEBTEDNESS—*Continued.*

| Date of Issue. | Series. | Rate of Interest. | Date of Maturities in the order of time. | Amount Maturing at dates named. |
|----------------|---------|-------------------|--|---------------------------------|
| April 1, 1880 | 3d | 3½ | April 1, 1902 | 5,000 00 |
| May 1, 1879 | 1st | 5 | May 1, 1902 | 10,000 00 |
| April 1, 1880 | 3d | 3½ | April 1, 1903 | 5,000 00 |
| August 1, 1879 | 2d | 4½ | August 1, 1904 | 7,500 00 |
| August 1, 1879 | 2d | 4½ | August 1, 1907 | 8,000 00 |
| May 1, 1883 | 5th | 3½ | May 1, 1910 | 5,000 00 |
| August 1, 1879 | 2d | 4½ | August 1, 1910 | 8,000 00 |
| May 1, 1883 | 5th | 3½ | May 1, 1911 | 5,000 00 |
| May 1, 1883 | 5th | 3½ | May 1, 1912 | 5,000 00 |
| August 1, 1879 | 2d | 4½ | August 1, 1913 | 8,000 00 |
| May 1, 1883 | 5th | 3½ | May 1, 1913 | 5,000 00 |
| May 1, 1883 | 5th | 3½ | May 1, 1914 | 5,000 00 |
| May 1, 1883 | 5th | 3½ | May 1, 1915 | 5,000 00 |
| May 1, 1883 | 5th | 3½ | May 1, 1916 | 5,000 00 |
| August 1, 1879 | 2d | 4½ | August 1, 1916 | 8,000 00 |
| May 1, 1883 | 5th | 3½ | May 1, 1917 | 5,000 00 |
| May 1, 1883 | 5th | 3½ | May 1, 1918 | 5,000 00 |
| May 1, 1883 | 5th | 3½ | May 1, 1919 | 5,000 00 |
| August 1, 1879 | 2d | 4½ | August 1, 1919 | 8,000 00 |
| June 2, 1884 | 6th | 4 | June 1, 1903 | 5,000 00 |
| June 2, 1884 | 6th | 4 | June 1, 1904 | 5,000 00 |
| June 2, 1884 | 6th | 4 | June 1, 1905 | 10,000 00 |
| June 2, 1884 | 6th | 4 | June 1, 1906 | 10,000 00 |
| June 2, 1884 | 6th | 4 | June 1, 1908 | 10,000 00 |
| June 2, 1884 | 6th | 4 | June 1, 1909 | 10,000 00 |
| Total.. | | | | \$422,500 00 |

RAIN-FALL.

Through the kindness of Sergeant Barnes, of the United States Signal Service, we are again enabled to present the following record of the rain-fall, as taken by him, for the year 1884.

We also append a condensed statement of the rain-fall for the last fifty-eight years, giving the fall for each year and each month of the year, and also the monthly and yearly average for the entire term.

The rain-fall is also given for the months of January and February, 1885.

STATEMENT OF RAIN-FALL FOR 1884.

| Month. | Date. | Inches. | Monthly Totals. | Month. | Date. | Inches. | Monthly Totals. |
|----------|-------|---------|-----------------|----------|-------|---------|-----------------|
| Jan..... | 1 | *.14 | 2.98 in. | Feb..... | 1 | *.05 | 3.85 in. |
| | 2 | †1.00 | | | 2 | *.02 | |
| | 8 | *.13 | | | 4 | *.10 | |
| | 9 | †.32 | | | 5 | *.47 | |
| | 11 | †.05 | | | 6 | .23 | |
| | 13 | †.01 | | | 8 | *.08 | |
| | 19 | †.20 | | | 9 | .03 | |
| | 20 | †.12 | | | 11 | *.21 | |
| | 24 | *.45 | | | 12 | †.18 | |
| | 28 | *.12 | | | 13 | .10 | |
| | 29 | *.16 | | | 14 | .36 | |
| | 30 | †.28 | | | 17 | .68 | |
| | | | | | 18 | .21 | |
| | | | | | 19 | .06 | |
| | | | | | 20 | .22 | |
| | | | | | 23 | †.32 | |
| | | | | | 25 | *.07 | |
| | | | | | 26 | †.17 | |
| | | | | | 27 | .03 | |
| | | | | | 28 | *.26 | |

*Snow.

†Rain and snow.

STATEMENT OF RAIN-FALL—*Continued.*

| Month. | Date. | Inches. | Monthly Totals. | Month. | Date. | Inches. | Monthly Totals. | |
|----------|-------|----------|-----------------|----------|-------|----------|-----------------|-----|
| March.. | 3 | *.02 | 4.00 in. | June.... | 9 | .12 | 1.80 in. | |
| | 4 | *.01 | | | 10 | .37 | | |
| | 5 | *.07 | | | 12 | .27 | | |
| | 6 | *.03 | | | 13 | .02 | | |
| | 7 | †.19 | | | 19 | .13 | | |
| | 8 | †.86 | | | 20 | .01 | | |
| | 9 | †.56 | | 24 | .32 | July.... | 1 | .12 |
| | 11 | .25 | | 25 | .49 | | 2 | .56 |
| | 12 | .14 | | 26 | .07 | | 4 | .20 |
| | 14 | †.17 | | 5 | .77 | | | |
| | 15 | *.09 | | 6 | .05 | | | |
| | 17 | .02 | | 8 | 1.05 | | | |
| | 19 | †.55 | | 9 | .03 | | | |
| | 20 | .23 | | 12 | .76 | | | |
| | 23 | .06 | | 13 | .16 | | | |
| | 26 | .42 | | 19 | .01 | | | |
| | 27 | .33 | | 22 | .28 | | | |
| April... | 2 | *.79 | 2.09 in. | 23 | .41 | | | |
| | 3 | *.21 | | 25 | .03 | | | |
| | 4 | *.01 | | 27 | .38 | | | |
| | 5 | *.04 | | 29 | .21 | | | |
| | 9 | .26 | | 31 | .02 | | | |
| | 10 | .41 | | Aug..... | 5 | 1.05 | | |
| | 15 | .14 | | | 6 | .14 | | |
| | 16 | .15 | | | 10 | .26 | | |
| 18 | .08 | 11 | .01 | | | | | |
| May.... | 5 | .19 | 21 | | .02 | | | |
| | 6 | .21 | 22 | | .49 | | | |
| | 7 | .27 | 26 | | .57 | | | |
| | 8 | .25 | 29 | | 2.20 | | | |
| | 9 | .30 | 30 | .53 | | | | |
| | 10 | .05 | 5.27 in. | | | | | |
| | 14 | .30 | | | | | | |
| | 15 | .07 | | | | | | |
| | 16 | .63 | | | | | | |
| | 17 | .07 | | | | | | |
| | 20 | .02 | | | | | | |
| | 23 | .20 | | | | | | |
| | 24 | .10 | | | | | | |
| 26 | .01 | | | | | | | |
| 27 | .12 | 2.79 in. | | | | | | |

*Snow.

†Rain and snow.

STATEMENT OF RAIN-FALL—*Continued.*

| Month. | Date. | Inches. | Monthly Totals. | Month. | Date. | Inches. | Monthly Totals. |
|--------------|-------|---------|-----------------|------------|-------|---------|-----------------|
| Sept. . . . | 7 | .26 | 1.80 in. | Nov. . . . | 1 | .03 | 3.44 in. |
| | 8 | .47 | | | 4 | .50 | |
| | 11 | .51 | | | 5 | .43 | |
| | 20 | .03 | | | 8 | .03 | |
| | 23 | .03 | | | 13 | .01 | |
| | 24 | .08 | | | 19 | *.35 | |
| | 25 | .03 | | | 20 | *.34 | |
| | 27 | .03 | | | 23 | .95 | |
| | 28 | .36 | | | 24 | .30 | |
| Oct. | 3 | .20 | 2.64 in. | Dec. . . . | 28 | .34 | 3.20 in. |
| | 4 | .66 | | | 29 | .16 | |
| | 5 | .02 | | | 6 | .77 | |
| | 6 | .05 | | | 7 | .59 | |
| | 12 | .46 | | | 11 | *.02 | |
| | 18 | .13 | | | 12 | *.03 | |
| | 22 | .16 | | | 13 | *.17 | |
| | 28 | .07 | | | 14 | *.04 | |
| | 29 | .51 | | | 15 | *.30 | |
| | 30 | .31 | | | 17 | *.20 | |
| | 31 | .07 | | | 21 | *.57 | |
| | | | | | 22 | .11 | |
| | | | | | 24 | *.29 | |
| | | | | | 25 | *.04 | |
| | | | | | 26 | *.03 | |
| | | | | | 31 | .04 | |

*Snow.

†Snow and rain.

RECAPITULATION.

| | |
|----------------|---------------|
| January..... | 2.98 inches. |
| February..... | 3.85 " |
| March..... | 4.00 " |
| April..... | 2.09 " |
| May..... | 2.79 " |
| June..... | 1.80 " |
| July..... | 5.04 " |
| August..... | 5.27 " |
| September..... | 1.80 " |
| October..... | 2.64 " |
| November..... | 3.44 " |
| December..... | 3.20 " |
| Total..... | 38.90 inches. |

RAIN-FALL FOR JANUARY AND FEBRUARY, 1885.

| | |
|---|-------------------|
| Jan'y 1..... .10 | Feb'y 1.....*.02 |
| 6..... .53 | 4.. ....†.07 |
| 7..... .01 | 8.....*.14 |
| 11..... .01 | 9..... .07 |
| 12..... .39 | 10.....†.50 |
| 15.....*.03 | 15.....*.03 |
| 16.....†.90 | 16.....*.51 |
| 17..... .17 | 18.....*.03 |
| 24.....†.22 | 27.....*.01 |
| 25.....*.04 | ———— 1.38 inches. |
| 27.....*.01 | |
| 28.....*.66 | |
| 30.....*.02 | |
| ———— 3.09 inches. | |
| Total for January and February, 1885..... | 4.47 inches. |

*Snow. †Snow and rain.

METEOROLOGICAL REGISTER CONDENSED.

FROM JANUARY 1, 1826, TO DECEMBER 31, 1824, BOTH INCLUSIVE.

| Years. | Jan. | Feb. | March. | April. | May. | June. | July. | August. | Sept. | Oct. | Nov. | Dec. | Total Fall. |
|--------|------|------|--------|--------|------|-------|-------|---------|-------|------|------|------|-------------|
| 1826 | 2.42 | 1.64 | 2.56 | 1.77 | .93 | 7.45 | 4.62 | 1.14 | 3.90 | 2.22 | 1.52 | 1.99 | 32.16 |
| 1827 | 5.18 | 2.42 | 2.24 | 3.98 | 3.21 | 3.64 | 4.28 | 4.88 | 4.27 | 4.32 | 4.19 | 4.20 | 46.81 |
| 1828 | 1.89 | 1.89 | 1.17 | 2.50 | 4.41 | 4.25 | 5.15 | 1.24 | 7.97 | 1.58 | 5.65 | .21 | 37.91 |
| 1829 | 4.68 | 3.19 | 2.49 | 4.92 | 3.26 | 3.48 | 3.23 | 1.61 | 2.92 | 2.78 | 3.77 | 2.01 | 38.34 |
| 1830 | .97 | 1.44 | 4.97 | 2.09 | 3.46 | 8.23 | 3.92 | 2.05 | 2.11 | 2.55 | 5.48 | 3.40 | 40.67 |
| 1831 | 1.62 | 2.01 | 2.36 | 5.18 | 2.75 | 3.98 | 3.93 | 3.41 | 3.92 | 5.20 | 2.31 | 1.16 | 37.83 |
| 1832 | 4.52 | 5.52 | 1.99 | 3.11 | 4.17 | 3.23 | 5.13 | 4.41 | 2.37 | 4.00 | 3.55 | 3.83 | 45.83 |
| 1833 | 2.92 | 2.85 | 1.91 | .87 | 7.86 | 3.12 | 4.08 | 3.50 | 3.50 | 8.40 | 3.67 | 1.55 | 44.23 |
| 1834 | .95 | .33 | 1.82 | 2.52 | 3.04 | 2.87 | 3.24 | 1.53 | 1.99 | 4.02 | .80 | 2.60 | 25.71 |
| 1835 | .25 | 1.30 | .17 | 1.52 | 1.86 | 4.83 | 2.10 | 4.10 | .95 | 1.96 | 2.11 | 1.00 | 22.15 |
| 1836 | 4.93 | 2.70 | 1.25 | 1.60 | 2.38 | 4.69 | 1.93 | 1.57 | 1.61 | 4.40 | 2.45 | 4.07 | 33.58 |
| 1837 | 1.78 | 2.08 | 2.31 | 2.26 | 4.74 | 4.65 | 5.50 | 2.46 | 1.55 | 2.47 | 1.77 | 1.77 | 33.34 |
| 1839 | 1.00 | .15 | .58 | 1.24 | .92 | 2.65 | 2.19 | .92 | 2.59 | 1.70 | 1.12 | 3.26 | 18.32 |
| 1840 | 1.90 | 2.85 | 3.08 | 3.52 | .20 | 1.93 | 1.98 | 2.55 | 2.01 | 3.48 | 1.41 | 3.30 | 29.21 |
| 1841 | 2.30 | .92 | 1.75 | 1.50 | 1.69 | 2.00 | 1.29 | 3.30 | 4.10 | .85 | 2.87 | 5.27 | 27.84 |
| 1842 | 2.25 | 1.00 | 2.06 | 4.43 | .90 | 3.17 | 2.40 | 3.35 | 2.90 | 1.95 | 1.20 | 3.95 | 29.56 |
| 1843 | 1.80 | 1.90 | 3.45 | 2.90 | .73 | 4.10 | 2.45 | 5.10 | 2.80 | 4.05 | 2.20 | 1.40 | 32.88 |
| 1844 | .81 | 1.95 | 1.15 | .50 | 4.35 | 3.45 | 3.60 | 1.45 | 1.10 | 3.05 | 1.65 | 1.40 | 24.46 |
| 1845 | 2.20 | 1.60 | 3.00 | 1.50 | 2.50 | 2.35 | 4.10 | 4.10 | 4.35 | 2.05 | 2.10 | 2.50 | 30.75 |
| 1846 | 1.50 | 3.70 | 2.95 | .25 | 2.37 | 4.41 | 6.02 | 1.38 | 3.50 | 2.83 | 5.59 | 2.98 | 37.48 |
| 1847 | | | | | | | | 1.49 | 4.27 | 3.64 | 1.76 | 4.17 | 15.33 |

RECORD WANTING.

METEOROLOGICAL RECORD—Continued.

| Years. | Jan. | Feb. | March. | April.. | May. | June. | July. | August. | Sept. | Oct. | Nov. | Dec. | Total Fall. |
|--------|------|------|--------|---------|------|-------|-------|---------|-------|-------|------|------|-------------|
| 1848 | 2.27 | 1.81 | 1.99 | .78 | 6.01 | 2.91 | 6.36 | 3.47 | 2.99 | 3.45 | 1.91 | 4.69 | 38.64 |
| 1849 | .82 | .80 | 2.58 | .90 | 4.60 | 5.06 | 1.15 | 4.87 | 1.26 | 6.98 | 2.53 | 2.18 | 33.73 |
| 1850 | 2.65 | 1.87 | .45 | 2.86 | 5.40 | 3.20 | 5.98 | 3.07 | 5.08 | 4.41 | 2.42 | 3.47 | 40.86 |
| 1851 | .67 | 3.86 | .65 | 3.28 | 2.33 | 4.26 | 4.66 | 1.68 | 1.08 | 2.46 | 4.61 | .29 | 29.83 |
| 1852 | 2.54 | 1.11 | 2.73 | 4.29 | 2.41 | 1.86 | 3.19 | 2.48 | 1.35 | 3.04 | 4.09 | 2.80 | 31.89 |
| 1853 | 1.12 | 2.53 | 2.20 | 3.55 | 6.36 | 1.75 | 3.74 | 3.71 | 6.10 | 3.17 | 3.33 | 1.60 | 40.16 |
| 1854 | 2.46 | 2.50 | 2.49 | 5.83 | 1.87 | 3.05 | 2.58 | 1.09 | 2.28 | 2.49 | 2.30 | 2.08 | 31.02 |
| 1855 | 2.37 | 1.46 | .59 | 3.27 | 1.94 | 6.05 | 4.42 | 4.05 | 1.55 | 9.42 | 3.37 | 3.74 | 42.23 |
| 1856 | 1.00 | .23 | 1.22 | 2.31 | 5.15 | 3.44 | 1.74 | 11.09 | 4.00 | 1.16 | 2.75 | 2.70 | 36.79 |
| 1857 | 2.50 | 1.78 | 1.05 | 6.36 | 3.70 | 4.63 | 3.51 | 3.64 | 2.22 | 3.31 | 1.94 | 3.87 | 38.51 |
| 1858 | 2.00 | 1.63 | .61 | 2.68 | 3.35 | 2.67 | 9.19 | 2.98 | 2.31 | 3.10 | 3.09 | 2.67 | 36.28 |
| 1859 | 3.13 | 1.94 | 2.99 | 3.38 | 2.19 | 4.27 | 2.92 | 2.53 | 4.55 | 1.22 | 3.48 | 3.77 | 36.37 |
| 1860 | .41 | 1.61 | 2.35 | 1.38 | 2.46 | 3.54 | 4.34 | 8.46 | 4.39 | 2.24 | 3.64 | 2.30 | 37.12 |
| 1861 | 3.47 | 2.60 | 3.68 | 6.28 | 3.82 | 1.64 | 4.95 | 4.59 | 3.14 | 3.20 | 2.72 | 1.65 | 41.74 |
| 1862 | 5.33 | 2.07 | 3.77 | 1.83 | .91 | 7.67 | 4.25 | 2.27 | .84 | 3.72 | 4.32 | 1.54 | 38.52 |
| 1863 | 4.92 | 2.51 | 4.04 | 1.38 | 5.55 | 2.04 | 7.66 | 7.24 | 1.62 | 2.32 | 5.02 | 4.10 | 48.40 |
| 1864 | 1.61 | .86 | 3.50 | 4.62 | 2.43 | .62 | 1.06 | 5.69 | 2.72 | 2.68 | 3.68 | 3.92 | 33.39 |
| 1865 | 2.27 | 1.96 | 4.84 | 2.87 | 5.97 | 1.98 | 3.62 | .93 | 2.14 | 3.88 | 2.67 | 1.38 | 34.51 |
| 1866 | 1.35 | 1.70 | 1.08 | 1.45 | 2.43 | 6.71 | 3.85 | 3.18 | 4.73 | 1.68 | 2.94 | .66 | 31.76 |
| 1867 | 2.42 | 1.91 | 2.26 | 3.20 | 5.75 | 3.24 | 3.41 | 7.29 | 1.50 | 3.20 | 1.64 | 1.24 | 37.06 |
| 1868 | 3.33 | .86 | 2.06 | 3.79 | 6.33 | 3.20 | 2.35 | 3.85 | 8.48 | 1.58 | 4.94 | 1.64 | 42.41 |
| 1869 | 3.99 | 3.33 | 3.81 | 2.72 | 2.04 | 5.79 | 2.49 | 1.76 | 3.45 | 13.80 | .58 | 4.24 | 48.05 |

METEOROLOGICAL RECORD—Continued.

| Years. | Jan. | Feb. | March. | April. | May. | June. | July. | August. | Sept. | Oct. | Nov. | Dec. | Total Fall |
|--------|--------|--------|--------|--------|--------|--------|--------|---------|--------|--------|--------|--------|------------|
| 1870 | 4.47 | 5.08 | 3.59 | 2.42 | 1.44 | 5.65 | 5.01 | 5.56 | 3.01 | 2.87 | 1.82 | 1.06 | 41.98 |
| 1871 | 1.60 | 1.64 | 3.85 | 2.40 | 3.05 | 4.81 | 7.24 | 8.92 | 1.78 | 2.37 | 2.24 | 1.80 | 41.70 |
| 1872 | .78 | 1.74 | 2.70 | 1.81 | 4.79 | 4.68 | 5.60 | 4.84 | 2.55 | 4.68 | 2.77 | 2.18 | 39.12 |
| 1873 | 3.32 | 2.11 | 3.65 | 1.99 | 1.98 | .99 | 5.97 | 2.27 | 4.78 | 5.57 | 3.75 | 3.03 | 39.41 |
| 1874 | 3.96 | 3.76 | 1.86 | 5.37 | 2.27 | 7.22 | 6.23 | .77 | 2.78 | 1.76 | 2.55 | .84 | 39.37 |
| 1875 | 2.21 | 1.65 | 3.46 | 2.79 | 2.15 | 3.67 | 4.40 | 4.78 | 2.42 | 5.44 | 2.25 | 1.20 | 36.42 |
| 1876 | 1.57 | 4.09 | 4.28 | 3.51 | 2.96 | 4.40 | 4.97 | .53 | 5.17 | 1.64 | 2.65 | 2.42 | 38.19 |
| 1877 | 1.94 | .34 | 2.66 | 2.13 | 1.55 | 4.52 | 5.00 | 2.06 | 1.13 | 7.84 | 3.14 | .59 | 32.90 |
| 1878 | 4.01 | 3.72 | 1.94 | 4.53 | 4.60 | 4.68 | 6.12 | 3.80 | 2.63 | 3.32 | 5.18 | 4.70 | 49.23 |
| 1879 | 2.72 | 2.23 | 3.82 | 2.90 | .65 | 7.42 | 5.82 | 3.60 | 3.55 | 1.80 | 3.53 | 4.22 | 42.26 |
| 1880 | 2.80 | 1.87 | 1.20 | 2.07 | 3.03 | 1.09 | 3.04 | 2.76 | 2.88 | 2.43 | 2.49 | 1.99 | 27.65 |
| 1881 | 2.86 | 2.50 | 3.80 | 1.34 | 3.90 | 3.76 | 2.22 | 2.07 | 2.38 | 3.19 | 3.44 | 4.88 | 36.34 |
| 1882 | 2.64 | 3.31 | 1.79 | 1.27 | 4.15 | 3.98 | 3.97 | 1.38 | 7.79 | .27 | .97 | 2.24 | 33.76 |
| 1883 | 2.43 | 3.00 | 1.77 | 2.65 | 3.20 | 6.30 | 5.96 | 3.69 | 3.19 | 3.49 | 1.14 | 2.55 | 39.37 |
| 1884 | 2.98 | 3.85 | 4.00 | 2.09 | 2.79 | 1.80 | 5.04 | 5.27 | 1.80 | 2.64 | 3.44 | 3.20 | 38.90 |
| | 138.79 | 124.31 | 138.57 | 156.44 | 181.24 | 223.03 | 235.15 | 196.16 | 180.30 | 199.32 | 167.50 | 149.45 | 2090.26 |
| Avg's. | 2.43 | 2.18 | 2.43 | 2.74 | 3.18 | 3.91 | 4.13 | 3.44 | 3.11 | 3.44 | 2.89 | 2.40 | 36.28 |

REGULAR WATER RATES.

The following rates were, upon the recommendation of the Water Commissioners of the City of Troy, approved and adopted by the Common Council of 1855, and they now remain as then established :

FOR DWELLING HOUSES.

| | |
|---|---------|
| For house, lateral paid by owner..... | \$ 5 50 |
| For house, lateral paid by City..... | 6 50 |
| For two or more, having one lateral paid by City, each..... | 6 00 |
| For bathing tubs, each. | 3 00 |
| For water closets, each..... | 2 00 |

FOR TENEMENT HOUSES IN ALLEYS.

| | |
|--|------|
| For house with one or two tenements..... | 3 00 |
| For house with three tenements..... | 4 00 |
| For house with four tenements..... | 5 00 |
| For each additional tenement | 1 00 |

MISCELLANEOUS.

| | |
|--|-------|
| For boarding houses, from \$6,50 to..... | 12 00 |
| For public houses, from \$12 to | 60 00 |
| For stores and retail shops, from \$2 to..... | 6 50 |
| For barber shops..... | 4 00 |
| For stables, private, \$2 to..... | 6 00 |
| For stables, livery, per single stall. | 1 50 |
| For stables, carmen, per horse..... | 1 00 |
| For steam engines, from 1 to 5-horse power, each..... | 3 50 |
| For steam engines, from 5 to 10-horse power, each..... | 3 00 |
| For steam engines, from 10 and upward, each..... | 2 50 |
| For bakeries, from \$7 to..... | 12 00 |
| For vacant lots, per running foot..... | .02 |
| For malting, for 1,000 bushels malted..... | 1 00 |
| For breweries, 1 cent per bbl., from 1 to 2,000 bbls., brewed | |
| For breweries, $\frac{3}{4}$ cent per bbl., from 2 to 5,000 bbls., brewed | |
| For breweries, $\frac{5}{8}$ cent per bbl., from 5 to 10,000 bbls., brewed | |
| For breweries, $\frac{1}{2}$ cent per bbl., for 10,000 bbls., and upwards | |
| For distilleries, from \$25 to..... | 35 00 |
| For factories for dressing pelts, from \$15 to | 75 00 |

SPECIAL RATES.

The price of water for making mortar for building purposes, etc., is:

| | |
|-------------------------------------|-----------|
| For brick, per 1,000. | 7 cents. |
| For plastering, per 100 yards. | 30 cents. |
| For stone work, per 100 feet. | 6 cents. |

FOR SPRINKLING WITH SMALL HOSE.

| | |
|--|--------|
| For 25 feet front, per season. | \$3 00 |
| For 50 feet front, per season. | 5 00 |
| And 10 cents additional for each foot above 50 feet. | |

The above, like all other special rates, are payable in *advance* to the clerk in the office, from whom a *permit* must be obtained before using the water.

FOR WATER BY METER MEASURE.

The following rates have recently been established by the Board for consumers of water by meter measure, and are now in force, viz.:

When the consumption of water for a quarter is less than 100,000 gallons, at the rate of 20 cents per 1,000 gallons.

Between 100,000 gallons and less than 250,000 gallons, 17½ cents per 1,000 gallons.

Between 250,000 gallons and less than 500,000 gallons, 15 cents per 1,000 gallons.

Between 500,000 gallons and less than 750,000 gallons, 12½ cents per 1,000 gallons.

For 750,000 gallons and above that amount, 10 cents per 1,000 gallons.

For churches and sewing machines, 10 cents per 1,000 gallons.

Meters to be taken monthly. Bills to be rendered and paid quarterly.

LOCATION OF FIRE HYDRANTS.

| | |
|---------------------|---------------------------------|
| Adams street, | corner of River. |
| “ “ | alley between River and First. |
| Bank “ | corner of Brunswick avenue. |
| “ “ | corner of Prospect avenue. |
| Bleecker ave., | corner of Highland avenue. |
| “ “ | corner Tibbits avenue. |
| Broadway, | east of Union depot. |
| “ | corner Union street. |
| “ | corner of William. |
| “ | corner of Church. |
| “ | corner of Franklin. |
| “ | opposite Cannon Place. |
| “ | corner of Front. |
| Brunswick turnpike, | junction of Congress. |
| “ “ | near City line. |
| “ “ | middle of block. |
| Brunswick avenue, | corner of Congress. |
| Burdett avenue, | corner Hoosick. |
| “ “ | corner of Hutton. |
| “ “ | corner of Eagle. |
| “ “ | corner of Jacob. |
| Campbell's highway, | 150 feet west of Spring avenue. |
| Canal street, | corner of Vail avenue. |
| “ “ | corner North Fourth. |
| “ “ | corner of Orr. |
| Chestnut street, | corner of Elm. |
| “ “ | corner of Marshall. |
| Christie “ | corner of Congress. |
| Clinton “ | corner of River. |
| “ “ | corner of President. |
| “ “ | corner of Water. |
| Collins avenue, | corner of Walker avenue. |
| Congress street, | east of River. |

| | |
|------------------|-----------------------------------|
| Congress street, | alley between River and First. |
| " | " corner of First. |
| " | " corner of Second. |
| " | " corner of Franklin. |
| " | " corner of Fourth. |
| " | " corner of Sixth. |
| " | " opposite No. 172. |
| " | " opposite No. 217. |
| " | " corner of Farm. |
| " | " opposite No. 271. |
| " | " opposite No. 315. |
| " | " corner of Marshall. |
| " | " corner of Marshall. |
| " | " opposite No. 377. |
| " | " opposite File works. |
| " | " opposite Farnam steamer house. |
| Cragin avenue, | corner of Glen avenue. |
| " | " corner of Park avenue. |
| Cypress street, | corner of Elm. |
| Division | " corner of River. |
| " | " alley between River and First. |
| " | " corner of First. |
| " | " alley between First and Second. |
| " | " alley between Second and Third. |
| " | " corner of Third. |
| " | " alley between Third and Fourth. |
| Douw | " corner of President. |
| " | " 250 feet west of President. |
| Eighth | " opposite No. 472. |
| " | " opposite No. 448. |
| " | " corner of North Adams. |
| " | " north of Hoosick. |
| " | " opposite Orphan Asylum. |
| " | " opposite No. 304. |
| " | " corner of Hutton. |
| " | " corner of Eagle. |
| " | " corner of Eagle. |
| " | " corner of Jacob. |

| | |
|----------------|----------------------------------|
| Eighth street, | opposite No. 186. |
| “ “ | opposite No. 180. |
| “ “ | corner of Federal. |
| “ “ | corner of Federal. |
| “ “ | corner of Grand Division. |
| “ “ | corner of Fulton. |
| “ “ | opposite Polytechnic Institute. |
| “ “ | opposite Polytechnic Institute. |
| “ “ | opposite No. 38. |
| “ “ | corner of South. |
| “ “ | corner of Congress. |
| Eleventh “ | corner of Hutton. |
| Elm “ | 227 feet west of Oakwood avenue. |
| “ “ | 445 feet west of Oakwood avenue. |
| Farm “ | corner of Russell. |
| Federal “ | corner of River. |
| “ “ | corner of North Second. |
| “ “ | corner of North Third. |
| “ “ | opposite North Fourth. |
| Ferry “ | alley between Fourth and Fifth. |
| “ “ | opposite Read's alley. |
| “ “ | corner of Sixth. |
| “ “ | opposite No. 171. |
| “ “ | opposite No. 192. |
| “ “ | junction of Congress. |
| “ “ | alley between Third and Fourth. |
| “ “ | alley between Second and Third. |
| “ “ | alley between First and Second. |
| “ “ | corner of First. |
| “ “ | alley between River and First. |
| “ “ | corner of River |
| Fifteenth “ | corner of South. |
| “ “ | corner of Tibbits avenue. |
| “ “ | corner of Christie. |
| “ “ | corner of Marshall. |
| “ “ | corner of Eagle. |
| “ “ | corner of Jacob. |
| Fifth “ | corner of Fulton. |

| | | |
|--------|---------|---|
| Fifth | street, | corner of Broadway. |
| " | " | corner of State. |
| " | " | corner of Congress. |
| " | " | corner of Ferry. |
| " | " | opposite No. 177. |
| " | " | corner of Liberty. |
| " | " | corner of Hill. |
| " | " | corner of alley between Fifth and Hill. |
| " | " | corner of Canal avenue. |
| First | " | corner of State. |
| " | " | corner of Ferry. |
| " | " | corner of Division. |
| " | " | corner of Washington. |
| " | " | corner of Adams. |
| " | " | corner of Jefferson. |
| " | " | corner Canal avenue. |
| " | " | corner of Madison. |
| " | " | corner of Jackson. |
| " | " | corner of Van Buren. |
| Fourth | " | corner of Hutton. |
| " | " | corner of Eagle. |
| " | " | corner of Jacob. |
| " | " | corner of People's avenue. |
| " | " | corner of South. |
| " | " | corner of Christie. |
| " | " | corner of Marshall. |
| Fourth | " | corner of Grand Division. |
| " | " | corner of Fulton. |
| " | " | corner of Broadway. |
| " | " | corner of State. |
| " | " | corner of Congress. |
| " | " | corner of Ferry. |
| " | " | corner of Division. |
| " | " | corner of Liberty. |
| " | " | corner of Washington. |
| " | " | corner of Adams. |
| " | " | corner of Jefferson. |
| " | " | corner of Canal avenue. |

| | |
|-----------------|--|
| Fourth street, | opposite No. 370. |
| “ “ | corner of Madison. |
| “ “ | opposite No. 404. |
| “ “ | corner of Monroe. |
| “ “ | corner of Hanover. |
| “ “ | corner of Jackson. |
| “ “ | corner of Trenton. |
| “ “ | corner of Van Buren. |
| “ “ | corner of Lincoln avenue. |
| “ “ | corner of Harrison. |
| “ “ | corner of Tyler. |
| “ “ | corner of St. Joseph's avenue. |
| “ “ | corner of Polk. |
| “ “ | corner of Van Every avenue. |
| “ “ | corner of Main. |
| “ “ | corner of Centre. |
| “ “ | corner of Stow. |
| “ “ | corner of Kelly. |
| “ “ | corner of Cross. |
| “ “ | opposite Mill. |
| Fulton “ | east of Union Depot. |
| “ “ | corner of alley between Fifth and Sixth. |
| “ “ | corner of Union. |
| “ “ | corner of William. |
| “ “ | corner of Church. |
| “ “ | corner of River. |
| Glen avenue, | corner of North Fourth. |
| “ “ | opposite No. 51. |
| “ “ | at T. & B. railroad. |
| G'd Division, | corner of River. |
| “ “ | corner of Fourth. |
| “ “ | corner of Fifth. |
| “ “ | corner of Union. |
| “ “ | corner of Sixth. |
| “ “ | corner of Seventh. |
| Gre'nbush road, | corner of Batavia. |
| “ “ | opposite rolling mill. |
| “ “ | junction Stow avenue. |

| | |
|-------------------|-----------------------------|
| Hanover street, | corner of Bedford. |
| Harrison Place, | opposite No. 20. |
| Havermans avenue, | southerly end. |
| Highland ave., | corner of Brunswick avenue. |
| “ | “ at west end. |
| “ | “ middle of block. |
| Hill street, | south of Washington. |
| “ | “ corner of Adams. |
| “ | “ corner of Sixth. |
| “ | “ corner of Seventh. |
| “ | “ opposite No. 192. |
| “ | “ north of bridge. |
| Hoosick | “ corner of Green. |
| “ | “ corner of Eighth. |
| “ | “ corner of Eighth. |
| “ | “ corner of Sixteenth. |
| “ | “ corner of Seventeenth. |
| “ | “ corner of Eighteenth. |
| “ | “ corner of Nineteenth. |
| House avenue, | corner of Tenth. |
| Hutton street, | corner of Seventeenth. |
| “ | “ corner of Sixteenth. |
| “ | “ corner of Fifteenth. |
| “ | “ corner of Twelfth. |
| “ | “ corner of Eighth. |
| “ | “ corner of North Third. |
| “ | “ corner of Green. |
| “ | “ corner of North Second. |
| “ | “ corner of North First. |
| “ | “ corner of River. |
| Ida | “ corner of First. |
| “ | “ corner of Second. |
| “ | “ corner of Third. |
| “ | “ corner of Fourth. |
| “ | “ corner of Fifth. |
| Jackson, | “ corner of Third. |
| Jacob | “ corner of River. |
| “ | “ corner of North Third. |

| | |
|-----------------|---------------------------------|
| Jacob street, | corner of North Fourth. |
| “ “ | corner of Eighth. |
| “ “ | corner of Tenth. |
| “ “ | corner of Eleventh. |
| “ “ | corner of Twelfth. |
| “ “ | corner of Thirteenth. |
| “ “ | corner of Sixteenth. |
| Jefferson “ | alley between Fourth and Fifth. |
| “ “ | corner of Fifth. |
| “ “ | corner of Sixth. |
| King “ | opposite No. 34. |
| “ “ | corner of Jacob. |
| Lansing ave., | middle of block. |
| Liberty street, | east of River. |
| “ “ | alley between First and River. |
| “ “ | corner of First. |
| “ “ | corner of Second. |
| “ “ | corner of Church. |
| “ “ | corner of Hill. |
| “ “ | corner of St. Mary's avenue. |
| Linden avenue, | corner of Pawling avenue. |
| “ “ | middle of block. |
| “ “ | 500 feet west of Pawling. |
| “ “ | at Marshall Infirmary. |
| Locust “ | corner of Pawling. |
| “ “ | 400 feet west of Pawling. |
| Madison street, | west side of River. |
| “ “ | east side of River. |
| “ “ | alley between First and Second. |
| “ “ | alley between Second and Third. |
| “ “ | alley between Third and Fourth. |
| “ “ | alley between Fourth and Fifth. |
| “ “ | corner of Fifth. |
| Mann avenue, | corner of Fourth. |
| “ “ | corner of Willow. |
| “ “ | corner of Hudson. |
| Maple avenue, | corner of Spring avenue. |
| “ “ | corner of Pawling avenue. |

| | |
|------------------|-----------------------------------|
| Maple avenue, | middle of block. |
| " | " corner of Lansing avenue. |
| " | " corner of Collins avenue. |
| Mechanic street, | corner of Grand Division. |
| " | " middle of block |
| " | " corner of Fulton. |
| Mill | " east of Fourth. |
| " | " 700 feet east of Fourth. |
| " | " 1,000 " " " |
| " | " 1,300 " " " |
| " | " 1,600 " " " |
| " | " 1,900 " " " |
| " | " 2,200 " " " |
| Middleb'h | " corner of River. |
| " | " corner of Vail avenue. |
| " | " corner of North Fourth. |
| " | " corner of Eighth, west side. |
| " | " corner of Eighth, east side. |
| Monroe | " corner of River. |
| " | " alley between River and First. |
| " | " corner of First. |
| " | " corner of Second. |
| " | " corner of Third. |
| " | " alley between Third and Fourth. |
| " | " corner of Fourth. |
| Mount | " corner of Canal. |
| " | " corner of Middleburgh. |
| " | " corner of North. |
| Myrtle avenue | corner of Spring. |
| " | " corner of Pawling avenue. |
| " | " middle of block. |
| Ninth street, | corner House avenue. |
| " | " 250 feet south of House avenue. |
| " | " middle of block. |
| " | " opposite Burton's. |
| " | " corner of Canal. |
| " | " N. W. corner of Middleburgh. |
| " | " S. W. corner of Middleburgh. |

| | |
|---------------|--------------------------------|
| Ninth street, | opposite No. 371. |
| " " | opposite No. 345. |
| " " | opposite No. 325. |
| " " | corner of North Adams. |
| " " | opposite No. 281. |
| " " | 300 feet North of Hoosick. |
| " " | corner of Hoosick. |
| " " | opposite No. 211. |
| " " | rear Troy Orphan Asylum. |
| " " | corner of Hutton. |
| " " | corner of Eagle. |
| " " | corner of Jacob. |
| " " | opposite People's avenue. |
| " " | corner of Federal. |
| North " | corner of River. |
| N. Fourth " | 200 feet south of Park avenue. |
| " " | corner of Hoosick. |
| " " | opposite No. 151. |
| " " | corner of Hutton. |
| " " | opposite No. 91. |
| " " | corner of Jacob. |
| " " | corner of Federal. |
| N. Second " | north of Rensselaer. |
| " " | corner of Rensselaer. |
| " " | corner of Jay. |
| " " | corner of Vanderheyden. |
| " " | corner of Hoosick. |
| " " | between Hoosick and Hutton. |
| " " | corner of Hutton. |
| " " | between Hutton and Jacob. |
| " " | corner of Jacob. |
| " " | opposite Christ Church. |
| " " | corner of Federal. |
| N. Third " | corner of Rensselaer. |
| " " | opposite Fales' Foundry. |
| " " | corner of Jay. |
| " " | corner of Vanderheyden. |
| " " | corner of Hoosick. |

| | |
|-------------------|----------------------------------|
| N. Third street, | corner of Hutton. |
| " | " opposite No. 40. |
| " | " corner of Federal. |
| Oakwood ave., | corner of Archibald. |
| " | " corner of Sausse. |
| " | " opposite No. 36. |
| " | " opposite R. Chichester's. |
| " | " opposite S. Bailey's. |
| " | " corner of Middleburgh. |
| " | " 300 feet north of Middleburgh. |
| " | " 600 feet north of Middleburgh. |
| " | " corner of Elm. |
| Park avenue, | corner of North Fourth. |
| " | " middle of block. |
| Pawling | " near Memorial Church. |
| " | " opposite 6 Dale View. |
| " | " junction Pine Woods avenue. |
| " | " opposite Huntington's. |
| " | " opposite Koon's. |
| " | " opposite Collins'. |
| " | " opposite Collins'. |
| " | " corner of Walker avenue. |
| People's | " corner of Tenth. |
| " | " corner of Twelfth. |
| Pine W'ds | " corner of Belle avenue. |
| " | " opposite Sweet's factory. |
| " | " corner of Lake street. |
| " | " Prospect avenue, at south end. |
| Read's alley, | corner of Pine. |
| Renssel'r street, | corner of River. |
| River | " corner of Cemetery avenue. |
| " | " corner of Turner's lane. |
| " | " corner of Clinton. |
| " | " corner of Smith avenue. |
| " | " corner of Douw. |
| " | " opposite No. 736. |
| " | " opposite Mt. Vernon mills. |
| " | " opposite Crystal Palace mills. |

| | |
|------------------|---------------------------------|
| River street, | corner of Jay. |
| " " | corner of Vanderheyden. |
| " " | corner of Hoosick. |
| " " | opposite No. 508. |
| " " | corner of Hutton. |
| " " | opposite Northern hotel. |
| " " | corner of Jacob. |
| " " | corner of Federal. |
| " " | opposite No. 336. |
| " " | corner of Fulton. |
| " " | corner of Third. |
| " " | alley between Second and Third. |
| " " | corner of Second. |
| " " | opposite No. 261. |
| " " | corner of Broadway. |
| " " | corner of First. |
| " " | junction of First, west side. |
| " " | corner of State. |
| " " | between State and Congress. |
| " " | corner of Congress. |
| " " | between Ferry and Congress. |
| " " | corner of Ferry. |
| " " | corner of Division. |
| " " | corner of Liberty. |
| " " | corner of Washington. |
| " " | between Washington and Adams. |
| Sausse " | east end. |
| " " | middle of block. |
| Sheldon avenue, | 400 feet west of Pawling. |
| St. John street, | 300 feet east of Fourth street. |
| St. Joseph " | corner of St. Mary's avenue. |
| " " | (South Troy), corner of Willow. |
| Second street, | N. E. corner of Broadway. |
| " " | S. E. corner of Broadway. |
| " " | S. E. corner of State. |
| " " | S. E. corner of Congress. |
| " " | N. W. corner of Ferry. |
| " " | S. E. corner of Ferry. |

| | |
|-----------------|------------------------------------|
| Second street, | N. W. corner of Division. |
| " " | S. E. corner of Division |
| " " | S. E. corner of Liberty. |
| " " | N. W. corner of Washington. |
| " " | S. E. corner of Washington. |
| " " | N. E. corner of Washington avenue. |
| " " | N. E. corner of Adams. |
| " " | S. E. corner of Adams. |
| " " | corner of Jefferson. |
| " " | at railroad crossing. |
| " " | corner of Ida. |
| " " | corner of Madison. |
| " " | corner of Monroe. |
| " " | corner of Jackson. |
| " " | corner of Van Buren. |
| " " | opposite No. 468. |
| " " | corner of Harrison. |
| " " | opposite No. 510. |
| " " | corner of Polk. |
| " " | opposite No 563. |
| " " | corner of Main. |
| Sevente'th | " between Hoosick and Hutton. |
| Seventh | " corner of Fulton. |
| " " | corner of Broadway. |
| " " | corner of State, north side. |
| " " | corner of State, south side. |
| " " | corner of Congress. |
| " " | south of Congress. |
| " " | corner of Ferry. |
| Sixth | " corner of State. |
| " " | corner of Ida. |
| Smith's avenue, | corner of River. |
| " " | corner of President. |
| " " | corner of Water. |
| South street, | opposite No. 25. |
| " " | opposite No. 37. |
| " " | opposite No. 73. |
| Spring avenue, | opposite Carter's. |

| | |
|-----------------|--------------------------------------|
| Spring avenue, | corner of Infirmary road. |
| State street, | corner of Sixth. |
| " " | corner of Second. |
| " " | alley between First and River. |
| " " | alley between First and Second. |
| " " | alley between Second and Third. |
| " " | alley between Third and Fourth. |
| Tenth | corner of Middleburgh. |
| " " | opposite No. 447. |
| " " | opposite No. 425. |
| " " | opposite 403. |
| " " | corner of North Adams. |
| " " | opposite No. 351. |
| " " | opposite No. 327. |
| " " | corner of Hoosick. |
| " " | opposite No. 285. |
| " " | opposite hospital of Little Sisters. |
| " " | corner of Hutton. |
| " " | corner of Eagle. |
| Third | corner of Broadway. |
| " " | corner of State. |
| " " | corner of Congress. |
| " " | corner of Ferry. |
| " " | corner of Division. |
| " " | corner of Liberty. |
| " " | corner of Washington. |
| " " | corner of Adams. |
| " " | corner of Jefferson. |
| " " | corner of Madison. |
| " " | corner of Jackson. |
| Thirteenth | corner of Christie. |
| " " | corner of Congress. |
| " " | corner of South. |
| " " | corner of Farm. |
| " " | opposite No. 48. |
| Tibbits avenue, | corner of Fourteenth. |
| " " | corner of Brunswick avenue. |
| " " | opposite Hayner's. |

| | |
|------------------------------|--------------------------------------|
| Tibbits avenue, | corner of Sixteenth. |
| Twelfth street, | corner of Eagle. |
| “ “ | south end of Main. |
| Tyler “ | corner of Willow. |
| Vail avenue, | corner of Turner's Lane. |
| “ . “ | north of M. E. Church. |
| “ “ | south of M. E. Church. |
| “ “ | corner of Canal. |
| “ “ | corner of North. |
| “ “ | corner of Middleburgh. |
| “ “ | corner of Douw. |
| “ “ | between Turner's Lane and City line. |
| “ “ | at City line. |
| Van Buren st., | corner of Third. |
| “ “ | alley between Third and Second. |
| Walker avenue, | corner of Lansing. |
| Walnut street, | corner of Elm. |
| “ “ | corner of Marshall. |
| Wash'ton “ | east of River. |
| “ “ | alley between River and First. |
| “ “ | alley between Fifth and Sixth. |
| Wash'ton ave., | centre of block. |
| Water street, | (South Troy) corner of Elm. |
| “ “ “ “ | junction of Lennon. |
| Total fire hydrants..... 516 | |

In addition to the above there are also two fire plugs at the pumping station in Lansingburgh.

PRIVATE FIRE HYDRANTS.

At Ludlow Valve Manufacturing Co.'s.
 At Waters' factory.
 North of Orr & Co.'s paper mill.
 South of Troy & Boston R. R. machine shop.
 At Gas works.
 South of N. Y. C. & H. R. R. machine shop.
 At Jones & Co.'s bell foundry.
 At Warren's, Ida Hill.

| | |
|---|----|
| At Warren's, Eighth street. | |
| At Clinton foundry. | |
| At Burden Iron Co., lower works. | |
| At Rensselaer County House of Industry (6). | |
| At Frear's, Oakwood avenue. | |
| At Eddy's, Glenwood. | |
| At Marshall Infirmary (2). | |
| At Bussey & McLeod foundry, Oakwood avenue. | |
| Total | 22 |

LOCATION, LENGTH AND SIZE
OF
STREET WATER MAINS.

(IN ALPHABETICAL ORDER.)

Adams street : 4 in.—From a point 50 feet west of River street
to centre of Hill street, 1,850 feet.

Alley between River and First streets :

- 6 in.—From the centre of Congress to centre of
Ferry, 413 feet.
- 1½ in.—From centre of Liberty 80 feet south, and
from centre of Washington 120 feet south.
- 6 in.—From centre of Adams north 183 feet.

Alley between First and Second streets :

- 3 in.—From centre of Broadway south 180 feet.
- 6 in.—Connecting therewith from centre of State 292
feet north.
- 1½ in.—From centre of State street south 180 feet.
- 6 in.—From centre of Ferry to centre of Division,
506 feet.

Alley between Second and Third streets :

- 1½ in.—From centre of River, south 80 feet.
- 6 in.—From centre of Broadway to centre of Ferry
street, 1,341 feet
- 1½ in.—From centre of Division, north 175 feet.
- 4 in.—From centre of Division to centre of Liberty,
279 feet.

Alley between Second and Third streets :

- 6 in.—From centre of Liberty to centre of Washing-
ton, 358 feet.

Alley between Third and Fourth streets :

- 4 in.—From centre of Fulton, south 380 feet.
- 1½ in.—From centre of Broadway, north 80 feet.
- 6 in.—From centre of Broadway to centre of State, 490 feet.

Alley between Fourth and Fifth streets :

- 1½ in.—From centre of Broadway, south 235 feet, and from centre of State, south 80 feet, and from centre of Congress, south 220 feet.

Alley between Fifth and Sixth streets :

- 6 in.—From centre of Grand Division, to centre of Fulton street, 409 feet.
- 3 in.—From south side of Liberty to centre of Washington, 325 feet.
- 4 in.—From centre of Washington, south 337 feet.

Alley between Sixth and Seventh streets :

- 6 in.—From centre of Grand Division street to centre of Fulton street, 284 feet.

Alley north of Congress street :

- 4 in.—From Congress street pipe, east 275 feet.

Alley between Congress and Ferry streets :

- 3 in.—From Seventh street, east 118 feet.
- 4 in.—From a point 118 feet east of Seventh street, 190 feet ; and
- 4 in.—Thence southerly to Ferry street, 106 feet.

Bank street :

- 6 in.—From a point 38 feet east of centre of Brunswick avenue, westwardly to centre of Prospect avenue, 510 feet.

Bleecker avenue :

- 6 in.—From Tibbits avenue to Highland, 467 feet.

Broadway :

- 6 in.—From centre of River street westwardly to blow-off at Front street, 200 feet.
- 8 in.—From centre of River street to centre of Seventh street, 1,825 feet.

Brunswick avenue :

- 20 in.—From centre of Tibbits avenue to centre of Congress street, 1,125 feet.

Brunswick Turnpike :

8 in.—From junction with 20-inch main in Congress street eastwardly to city line, 591 feet.

Burdett avenue : 20 in.—From south line of Hoosick street to centre of Tibbits avenue, 4,953 feet.

Campbell's highway :

12 in.—From Spring avenue to County House main, 150 feet.

Canal street : 12 in.—From Vail avenue to River street, 250 feet.

6 in.—From Vail avenue eastward to a point 10 feet east of the 20-inch main on Troy & Boston R. R. track, 690 feet.

Clinton street : 6 in.—From River street to west side of Water street, 502 feet.

Chestnut street : 6 in.—From Elm street, northwardly 400 feet.

Christie street : 6 in.—From Congress street to terminus east of Fifteenth street, 833 feet.

Collins avenue : 6 in.—From centre of Pawling avenue to centre Maple avenue, 1,175 feet.

Congress street : 10 in.—From River to west side Sixth street, 2,000 feet.

4 in.—From east side of Sixth street to centre of Seventh street, 150 feet.

8 in.—From centre of Seventh street to centre of Eighth street, 500 feet.

12 in.—From centre of Eighth street to centre of Brunswick avenue, 3,492 feet.

20 in.—From centre of Brunswick avenue to stone bridge, 347 feet.

Cragin avenue . 6 in.—From centre of Glen avenue to centre of Park avenue, 310 feet.

Cypress street : 6 in.—From Elm street to Congress, 423 feet.

- Division street : 6 in.—From River street to centre of Fourth, 1,322 feet.
 1½ in.—From centre of River, west 250 feet.
- Douw street : 4 in.—West of River street, 597 feet.
- Eagle street : 6 in.—From centre of Eighth street to a point 147 feet east of centre of Ninth street, 413 feet.
 6 in.—From centre of Fifteenth street, east 96 feet.
- Eighth street : 20 in.—From Middleburgh to Federal; 4,600 feet.
 16 in.—From centre of Federal street to centre of Congress street, 2,051 feet.
 8 in.—From centre of Hoosick street to a point 260 feet south of centre of Fulton, 3,169 feet.
- Eleventh street : 6 in.—From Jacob to Eagle street, 406 feet.
- Elm street : 5th W. 6 in.—From Chestnut street to Cypress, 187 feet.
- Elm st.: 13th W. 4 in.—From Oakwood avenue, westerly 552 feet.
- Farm street : 6 in.—From centre of Congress street, eastwardly to centre of Fourteenth street, 1,068 feet.
- Federal street : 20 in.—From Eighth street to River street, 1,395 feet.
 16 in.—From centre of Eighth street to centre of Ninth street, 266 feet.
- Ferry street : 6 in.—From River street to centre of Fourth, 1,350 feet.
 8 in.—From centre of Fourth to centre of Fifth street, 324 feet.
 6 in.—From centre of Fifth to centre of Seventh street, 517 feet.
 8 in.—From centre of Seventh street to junction with Congress street, 1,048 feet.
- Fifteenth street : 8 in.—From South street to Tibbits avenue, 410 feet.
 6 in.—From Tibbits avenue to Marshall street, 804 feet.
 6 in.—From a point 148 feet north of the centre of Hutton street to centre of Jacob street, 948 feet.

- Fifth street : 6 in.—From centre of Grand Division to a point 26 feet south of Liberty, 3,076 feet, and from a point 125 feet north of Washington to intersection of Hill street, 509 feet.
and from centre of Adams to centre of Ida street, 975 feet.
and from Canal avenue to centre of Madison street, 457 feet.
- First street : 4 in.—From River to Jefferson, 3,440 feet.
6 in.—From north line of Jefferson to junction with Second street, 4,329 feet.
- Fourth street : 20 in.—From Federal street to centre of Ida street, 5,274 feet.
4 in.—From centre of Ida to red bridge, 87 feet, and from Jackson, south 200 feet.
6 in.—From Canal avenue to centre of Madison, 456 feet.
16 in.—From centre of Madison to centre of Main, 4,030 feet.
12 in.—From centre of Main street to bridge on Wynantskill creek, 1,490 feet.
- Fourteenth street : 8 in.—From centre of Hutton street to People's avenue, 1,251 feet.
6 in.—From centre of Hutton street, northwardly 222 feet.
8 in.—From South to Marshall street, 1,243 feet.
- Fulton street : 8 in.—From Eighth street to east side of River, 1,588 feet.
6 in.—From east side River street to Mechanic street, 195 feet.
- Glen avenue : 6 in.—From River street eastwardly to Troy & Boston R. R. track, 1,300 feet
20 in.—From River street to force main in Vail avenue, 313 feet.
- Grand Division street : 6 in.—From River street westwardly, 226 feet.
10 in.—From River to east side of Sixth street, 813 feet.

6 in.—From east side of Sixth street to Seventh street, 306 feet.

8 in.—From Seventh street to Eighth street, 364 feet.

Green street : 6 in.—From Hoosick to Hutton street, 693 feet.

Greenbush road : 8 in.—From termination of main in Fourth street southwardly to connection with main in Water street, South Troy, 557 feet.

Hanover street : 6 in.—From centre of Fourth street, eastwardly 420 feet.

Harrison Place : 3 in.—From a point 441 feet north of Jacob street to a point 300 feet south of Jacob street, 741 feet.

4 in.—From the centre of Federal street, north 452 feet.

Highland avenue :

6 in.—From Bleeker avenue westwardly to terminus, 837 feet.

High service reservoir main :

20 in.—From reservoir to south line of Hoosick street, 4,468 feet.

Hill street : 4 in.—From centre of Liberty to intersection with Jefferson street, 1,650 feet.

6 in.—From Jefferson street to Spring avenue, 1,273 feet.

Hoosick street : 10 in.—From River street to centre of North Second, 320 feet.

6 in.—From centre of North Second to centre of North Third, 350 feet.

8 in.—From centre of North Third to centre of Eighth street, 526 feet.

12 in.—From centre of Eighth street to Iséngart's brewery, east of Tenth street, 583 feet.

12 in.—From Burdett avenue westwardly to a point west of Sixteenth street, 1,087 feet.

House avenue : 6 in.—From centre of Ninth street eastwardly, 336 feet.

- Hutton street : 6 in.—From centre of River street to a point 8 feet west of North Third street, 707 feet.
 4 in.—From a point 8 feet west of the centre of North Third street to centre of North Fourth street, 183 feet.
 8 in.—From centre of Eighth to centre of Fourteenth street, 1,569 feet.
 6 in.—From centre of Fourteenth to centre of Seventeenth street, 789 feet.
- Ida street : 8 in.—From centre of Sixth street to centre of Fourth, 670 feet.
 and from centre of Third to a point 24 feet west of First, 700 feet.
 20 in.—From centre of Fourth to centre of Third, 330 feet.
- Institute avenue : 4 in.—From centre of Broadway southward, 260 feet.
- Jackson street : 6 in.—From centre of First to centre of Second street, 340 feet.
 4 in.—From centre of Second street to centre of Fourth street, 525 feet.
- Jacob street : 6 in.—From centre of River street to centre of North Fourth street, 920 feet.
 8 in.—From centre of North Fourth to centre of Eighth street, 313 feet.
 6 in.—From centre of Eighth street to west line of Sixteenth street, 2,059 feet.
- Jay street : 6 in.—From centre of North Second to centre of North Third street, 328 feet.
- Jefferson street : 6 in.—From Second street to centre of Hill, 1,316 feet.
- King street : 6 in.—From upper intersection with River street to below corner King and Jacob, 500 feet.
 3 in.—Thence to lower intersection with River street, 500 feet.
- Lansing avenue : 6 in.—From centre of Maple avenue to centre of Walker avenue, 588 feet.

- Laundry Place : 3 in.—A branch of King street main, running south-east through Laundry place 100 feet, thence southward through alley 175 feet.
- Liberty street : 6 in.—From centre of River street to centre of Fifth, 1,688 feet.
4 in.—From St. Mary's avenue to Havermans avenue, 155 feet.
- Linden avenue : 6 in.—From the main in Pawling avenue westwardly to Marshall Infirmary, 1,116 feet.
- Locust avenue : 6 in.—From Pawling avenue westwardly, 421 feet.
- Low Service Main : 24 in.—From reservoir to connection with 12 and 20 inch mains at old Eddy reservoir, 1,394 feet.
20 in.—From old Eddy reservoir to centre of Middleburgh street, 1,700 feet.
12 in.—From old Eddy reservoir southwest to corner of Canal street and Vail avenue, 1,650 feet.
- Madison street : 6 in.—From centre of First to west side of River street, 393 feet.
8 in.—From centre of First to centre of Third, 675 feet.
16 in.—From centre of Third to centre of Fourth, 330 feet.
6 in.—From centre of Fourth street to centre of Fifth street, 340 feet.
- Main street : 8 in.—From Fourth street main, connecting with Second street pipe, 39 feet.
- Mann avenue ; 6 in.—From Fourth street eastwardly, 576 feet.
- Maple avenue : 6 in.—From centre of Pine Woods avenue to centre of Pawling avenue, 1,683 feet.
12 in.—From centre of Pawling avenue to centre of Spring avenue, 1,244 feet.
- Marshall street : 6 in.—From centre of Fourteenth to centre of Fifteenth street, 270 feet.
6 in.—From centre of Chestnut street to centre of Congress street, 338 feet.
8 in.—From centre of Congress street to centre of Fourteenth street, 170 feet.

- Mechanic street : 6 in.—From centre of Fulton to centre of Grand Division street, 450 feet.
- Middleburgh street :
 12 in.—From River street to centre of Oakwood avenue, 2,158 feet.
 4 in.—Extending west from River street, 275 feet.
- Middle Service Main :
 20 in.—From upper Oakwood reservoir to centre of Oakwood avenue, at a point 63 feet south of Elm street (including the Y on Oakwood avenue), 1,553 feet.
- Mill street : 8 in.—From centre of Fourth street, eastwardly 2,295 feet.
- Monroe street : 8 in.—From centre of Fourth street to a point 150 feet west of the west line of River street, 1,530 feet.
- Mount street : 4 in.—From centre of Canal street to North street, 730 feet.
- Myrtle avenue : 8 in.—From centre of Pawling avenue to centre of Spring avenue, 850 feet.
- Ninth street : 6 in.—From House avenue to centre of People's avenue, 5,745 feet.
 16 in.—From centre of People's avenue to centre of Federal street, 367 feet.
- North street : 8 in.—From centre of North Third to centre of Vail avenue, 56 feet.
- North Adams street :
 6 in.—From east side of Eighth to centre of Tenth, 494 feet.
- North Fourth street :
 6 in.—From a point distant 50 feet north of centre of Park avenue southwardly, 246 feet.
 4 in.—From centre of Hoosick street to centre of Federal street, 2,300 feet.

North Second street :

- 8 in.—From a point 146 feet north of Rensselaer street to centre of Jacob street, 2,869 feet.
- 6 in.—From centre of Jacob street to centre of Grand Division street, 950 feet.

North Third street :

- 8 in.—From centre of North street to centre of Hoosick street, 2,025 feet.
- 4 in.—From centre of Hoosick street to centre of Grand Division street, 2,475 feet.

Oakwood avenue :

- 20 in.—From junction with Tenth street northwardly to connection with force main, 3,762 feet.

Park avenue :

- 6 in.—From centre of North Fourth street to centre of Cragin avenue, 434 feet.

Pawling avenue :

- 16 in.—From North end of stone bridge to a point $48\frac{1}{2}$ feet south of the south line of Maple avenue, 4,286 feet.
- 12 in.—Thence to a point 12 feet south of the south line of Myrtle avenue, 301 feet.

People's avenue :

- 16 in.—From centre of Ninth to centre of Tenth street, 260 feet.
- 12 in.—From centre of Tenth street to centre of Burdett avenue, 2,633 feet.

Pine street :

- 6 in.—From centre of Fifth street to Read's alley, 167 feet.

Pine Woods avenue :

- 6 in.—From junction with Pawling avenue to Maple avenue, 2,259 feet.

President street :

- 4 in.—From a point 126 feet north of centre of Clinton street south, 379 feet.

Prospect avenue :

- 6 in.—From centre of Bank street southwardly, 300 feet.

Read's alley :

- 6 in.—From centre of Ferry to centre of Pine street, 530 feet.

| | |
|----------------------|---|
| Rensselaer street : | 8 in.—From centre of North Second to centre of North Third, 331 feet. |
| River street : | 12 in.—From City line on the north to the south line of Broadway, 8,670 feet. 12 in.—From Orr's mill to Middleburgh street (old pumping main), 400 feet. 6 in.—From the south line of Broadway to centre of Adams street, 3,192 feet. |
| Sausse street : | 6 in.—From centre of Oakwood avenue eastwardly, 522 feet. |
| Second street : | 12 in.—From River to centre of Ida, 4,182 feet. 4 in.—From centre of Ida to centre of Jackson, 1,768 feet. 6 in.—From centre of Jackson to below main connecting with Fourth street pipe, 2,873 feet. |
| Seventh street : | 8 in.—From centre of Grand Division street to centre of Ferry street, 2,140 feet. |
| Seventeenth street : | 6 in.—From centre of Hoosic street to centre of Hutton street, 950 feet. |
| Sheldon avenue : | 6 in.—From Pawling avenue westwardly, 437 feet. |
| Sixth street : | 4 in.—From centre of Grand Division street to a point 175 feet south of State street, 1,500 feet; and from thence two lines 4-inch pipe to centre of Congress, each 250 feet = 500 feet. 4 in.—From Liberty street south, 1,090 feet. 4 in.—From Hill street to centre of Ida street, 400 feet. |
| Sixteenth street : | 6 in.—From centre of Hutton street northwardly, 248 feet. |
| Smith's avenue : | 6 in.—From main in River street westwardly, 740 feet. |
| South street : | 8 in.—From Eighth street to Fifteenth, 1,859 feet. |
| Spring avenue : | 6 in.—From Hill street across bridge to centre of Infirmary road, 741 feet. |

12 in.—From centre of Maple avenue northwardly to Campbell's highway, 385 feet.

8 in.—From centre of Maple avenue to centre of Myrtle avenue, 430 feet.

State street : 6 in.—From River street easterly, 2,113 feet.

8 in.—Thence eastwardly to centre of Seventh street, 87 feet.

St. John street : 6 in.—From centre of Fourth street eastwardly, 428 feet.

St. Joseph street (Eighth Ward) .

6 in.—From centre of Fifth street to centre of St. Mary's avenue, 168 feet.

St. Joseph street (Sixth Ward) :

6 in.—From centre of Fourth street eastward, 316 feet

St. Peter's street : 4 in.—From centre of St. Mary's avenue to centre of Havermans avenue, 122 feet.

Tenth street : 6 in.—From centre of Middleburgh street to junction with Oakwood avenue, 1,766 feet ; and

20 in.—Connecting therewith to centre of People's avenue, 2,507 feet.

Third street : 12 in.—From River south, 50 feet.

10 in.—From a point 50 feet south of River to south line of Congress, 1,400 feet.

8 in.—From south line of Congress to south line of Liberty, 1,237 feet.

4 in.—From south line of Liberty to a point 90 feet south of Jefferson, 1,565 feet.

6 in.—From a point 90 feet south of Jefferson to centre of Ida, 285 feet.

20 in.—From centre of Ida to centre of Madison, 676 feet.

8 in.—From centre of Madison to centre of Van Buren, 1,574 feet.

Thirteenth street : 6 in.—From centre of South street to centre of Congress, 1,135 feet.

- Tibbits avenue : 20 in.—From centre of Burdett avenue to centre of Brunswick avenue, 640 feet.
8 in.—From centre of Brunswick avenue to centre of Fourteenth street, 910 feet.
- Twelfth street : 6 in.—From Hutton to Jacob street, 806 feet.
6 in.—From Jacob street southwardly, 317 feet.
- Tyler street : 8 in.—From east side of Second to a point 590 feet east of the corner of Fourth street, 860 feet.
- Vail avenue : 6 in.—From centre of Middleburgh to City line, 2,805 feet.
8 in.—From centre of Middleburgh to centre of North, 250 feet.
- Van Buren street : 6 in.—From centre of First to east side of Second, 350 feet.
8 in.—From east side of Second to centre of Fourth, 354 feet.
- Vanderheyden street : 6 in.—From centre of North Second street to centre of North Third street, 328 feet.
- Walker avenue : 6 in.—From centre of Pawling avenue to centre of Collins avenue, 681 feet.
- Walnut street : 6 in.—From Elm street to Marshall, 364 feet.
- Water street : 4 in.—From a point 92 feet north of the centre of Clinton street, south 348 feet.
- Water street (Sixth Ward) : 8 in.—From termination of main in Greenbush road to a point west of the junction of Lennon street, 825 feet.
- Washington street : 8 in.—From River street to centre of Fourth street, 1,368 feet.
4 in.—From centre of Fourth street to Sixth, 672 feet.

Washington avenue .

6 in.—From centre of Second street to centre of
Third street, 330 feet.

Washington Place :

3 in.—From a point in Second street pipe, 130 feet
north of Adams, running east 280 feet.

Fire Plug Laterals :

4 in.—Connecting plugs with the mains, 8,816 feet.

The foregoing embraces a complete schedule of all the water mains (exclusive of service laterals), laid in the City by the Troy Water Works to the present time ; giving the different sizes and lengths as they now are.

Following is a summary of the sizes and aggregate lengths of pipe :

| | |
|------------------------------|------------------------------|
| Twenty-four inch | 1,394 feet. |
| Twenty inch | 33,643 " |
| Sixteen inch | 11,590 " |
| Twelve inch | 28,725 " |
| Ten inch | 4,533 " |
| Eight inch | 39,382 " |
| Six inch | 80,703 " |
| Four inch | 34,612 " |
| Three inch | 2,419 " |
| One and a half inch | 1,500 " |
| <hr/> | |
| | 238,501 feet. |
| Thirty inch Force Main | 16,753 " |
| <hr/> | |
| Total | 255,254 feet. |
| Being | 48 $\frac{1314}{280}$ miles. |

INVENTORY OF STOCK ON HAND.

MARCH 1, 1885.

- 8 30-inch pipes.
 - 1 piece 30-inch pipe 9 feet 5 inches long.
 - 1 piece 30-inch pipe 7 feet 10 inches long.
 - 1 piece 30-inch pipe 3 feet 8 inches long.
- 12 24-inch pipes.
 - 2 pieces 24-inch pipe 7 feet long.
- 83 20-inch pipes.
 - 1 piece 20-inch pipe 6 feet 2 inches long (hub).
 - 1 piece 20-inch pipe 2 feet 2 inches long.
- 4 16-inch pipes.
 - 1 piece 16-inch pipe 10 feet 6 inches long.
 - 1 piece 16-inch pipe 8 feet long.
 - 1 piece 16-inch pipe 4 feet long.
 - 1 piece 16-inch pipe 3 feet long (hub).
- 35 12-inch pipes.
 - 1 piece 12-inch pipe 10 feet 6 inches long (hub).
 - 1 piece 12-inch pipe 9 feet 5 inches long.
 - 1 piece 12-inch pipe 9 feet long (second hand).
 - 1 piece 12-inch pipe 7 feet 2 inches long.
 - 1 piece 12-inch pipe 6 feet long (hub).
 - 1 piece 12-inch pipe 1 foot 3 inches long (hub).
 - 1 piece 12-inch pipe 1 foot 6 inches long.
- 2 10-inch pipes.
 - 1 piece 10 inch pipe 8 feet long.
- 114 8-inch pipes.
 - 2 pieces 8-inch pipe 11 feet long (hub).
 - 1 piece 8-inch pipe 6 feet long (hub).
- 46 6-inch pipes.
 - 1 piece 6-inch pipe 11 feet 6 inches long (hub).

- 1 piece 6-inch pipe 3 feet 9 inches long (hub).
- 1 piece 6-inch pipe 4 feet long.
- 1 piece 6-inch pipe 3 feet long.
- 1 piece 6-inch pipe 2 feet 6 inches long (second hand).
- 50 4-inch pipes.
- 24 3-inch pipes.
- 3 pieces 3-inch pipe.
- 2 2-inch pipes 6 feet long.
- 1 20x20x20x6 cross.
- 1 20x8 cross.
- 2 16x10 crosses.
- 1 16x8 cross.
- 1 16x6 cross.
- 1 12x8 cross.
- 5 12x6 crosses.
- 20 8x8 crosses.
- 20 6x6 crosses.
- 1 8x6 cross.
- 6 8x4 crosses.
- 7 6x4 crosses.
- 2 6x6 Ys.
- 14 4x4 crosses.
- 1 4x4 cross (second hand).
- 6 2x2 crosses.
- 1 20x20 Tee.
- 1 20x12 Tee.
- 1 20x6 Tee (second hand).
- 3 20x4 Tees.
- 3 16x10 Tees.
- 1 16x8 Tee.
- 1 16x6 Tee.
- 10 16x4 Tees.
- 2 12x8 Tees.
- 1 12x6 Tee.
- 6 12x4 Tees.
- 7 10x4 Tees.
- 6 8x8 Tees.
- 1 8x6 Tee.

- 11 8x4 Tees.
- 12 6x6 Tees.
- 9 4x4 Tees.
- 12 6x4 Tees.
- 6 3x3 Tees.
- 5 2x2 Tees.
- 4 30-inch bends.
- 4 16-inch bends.
- 15 12-inch $\frac{1}{4}$ and $\frac{1}{8}$ bends.
- 1 20-inch $\frac{1}{4}$ bend with 8-inch take off.
- 1 16-inch $\frac{1}{4}$ bend with 6-inch take off.
- 17 8-inch $\frac{1}{4}$ and $\frac{1}{8}$ bends.
- 18 6-inch $\frac{1}{4}$ and $\frac{1}{8}$ bends.
- 35 4-inch $\frac{1}{4}$ and $\frac{1}{8}$ bends.
- 6 3-inch $\frac{1}{4}$ bends.
- 4 2-inch $\frac{1}{4}$ bends.
- 4 4-inch offsets.
- 1 24 to 20 reducer.
- 1 20 to 12 reducer.
- 2 12 to 10 reducers.
- 7 12 to 8 reducers.
- 3 12 to 6 reducers.
- 1 12 to 4 reducer.
- 11 8 to 6 reducers.
- 6 8 to 4 reducers.
- 2 8 to 3 reducers.
- 16 6 to 4 reducers.
- 5 4 to 3 reducers.
- 2 30-inch sleeves.
- 7 24-inch sleeves.
- 4 20-inch sleeves.
- 6 16-inch sleeves.
- 14 12-inch sleeves.
- 11 10-inch sleeves.
- 7 8-inch sleeves.
- 8 6-inch sleeves.
- 1 6-inch flange-sleeve.
- 5 4-inch sleeves.

- 2 4-inch flange-sleeves.
- 15 second-hand 3-inch sleeves.
- 4 2-inch sleeves.
- 6 12-inch caps.
- 3 10-inch caps.
- 4 8-inch caps.
- 5 4-inch caps.
- 1 3-inch cap.
- 5 4-inch valves.
- 10 cast-iron boxes for street-valves.
- 11,972 lbs. assorted sizes lead pipe.
- 7,016 lbs. pig lead.
- 5 lbs. solder.
- 484 hydrant elbows. •
- 50 hydrant caps.
- 6 1-inch thimbles.
- 256 hydrant cranks.
- 275 hydrant spouts.
- 400 hydrant tubes.
- 200 hydrant rods.
- 10 Bailey valves.
- 500 2-inch brass screws and nuts.
- 350 $\frac{3}{4}$ -inch brass screws.
- 6 2-inch taps.
- 11 1 $\frac{1}{2}$ inch taps.
- 55 1 $\frac{1}{4}$ -inch taps, old style.
- 29 1-inch taps.
- 146 $\frac{3}{4}$ -inch taps.
- 1 2-inch stop and waste cock.
- 6 2-inch stop-cocks.
- 8 1 $\frac{1}{2}$ inch stop-cocks.
- 30 1 $\frac{1}{4}$ inch stop-cocks.
- 53 1-inch stop-cocks.
- 6 1-inch stop and waste-cocks.
- 99 $\frac{3}{4}$ -inch stop-cocks.
- 18 $\frac{3}{4}$ -inch stop and waste cocks.
- 10 $\frac{5}{8}$ -inch stop and waste cocks.
- 4 $\frac{3}{4}$ bibbs.

- 17 $\frac{5}{8}$ bibbs.
- 120 cast-iron boxes for stop-cocks, with tops and caps.
- 1 cast-iron yard-hydrant.
- 47 yard-hydrants.
- 92 hydrant-posts.
- 1 Bailey fire-plug.
- 100 feet tin tubing for thawing.
- 1 small boiler and apparatus for thawing.
- 109 lbs. packing yarn.
- 1 calendar clock.
- 1 leveling instrument.
- 3 volumes City district maps.
- 1 large water works map.
- 2 maps of the City of Troy.
- 1 Edson recording gauge.
- 2 lathes.
- 1 anvil.
- 3 vises.
- 1 steam pump with thawing apparatus.
- 1 force pump.
- 1 iron hand pump.
- 4 tin pumps.
- 1 wooden pump.
- 1 forge with cap and pipe.
- 1 stove with pipe, for coal.
- 1 platform scale.
- 2 derricks.
- 2 tapping machines.
- 2 sets triple falls.
- 1 grindstone.
- 4 hand lanterns.
- 1,400 fence posts, chestnut.
- 3 jumpers,
- 4 sledges.
- 6 crowbars.
- 2 large chains.
- 1 hand-cart.
- 1 large "Lillie" safe for office.

- 2 horses.
- 4 wagons.
- 4 sets harness.
- 1 sleigh.
- 4 horse blankets.

INVENTORY OF STOCK AT PUMPING STATION.

MARCH 1, 1885.

IN ENGINE ROOM.

- 2 sets Holly pumping engines.
- 2 donkey pumps.
- 4 steam radiators.
- 1 Edson recording gauge.
- 1 telephone.
- 1 clock.
- 4 chairs.
- 5 spittoons.
- 2 slates.
- 5 log-books.
- 1 book of requisitions.
- 3 hand lamps.
- 4 brass oil cans.
- 2 gland-wrenches.
- 4 screw-wrenches.
- 1 work-bench.
- 1 bench vise.
- 8 files.
- 3 step ladders.
- 1 steam engine card indicator.
- 1 test pump and gauge.
- 6 rubber mats.
- 1 hose carriage.
- 1 hose pipe $2\frac{1}{2} \times 1\frac{1}{8}$ inches.

- 250 2 1/2 inch leather hose.
- 1 hand saw.
- 2 planes.
- 1 extension bit.
- 1 bit brace.
- 1 barometer.
- 1 thermometer.
- 1 brass oil tray.
- 2 screw-drivers.
- 1 hatchet.
- 1 axe.
- 1 1/2 barrels cylinder oil.
- 30 gallons lard oil.
- 1 1/2 gallon measure.
- 1 1 gallon measure.
- 2 oil drip-pans.
- 1 quart brass can.
- 4 steam valves.
- 6 exhaust valves and seats.
- 1 10 gallon can.
- 2 5 gallon cans.

IN BOILER ROOM.

- 6 boilers and equipments.
- 1 donkey boiler and equipments.
- 2 iron wheelbarrows.
- 1 Fairbanks' scale.
- 4 shovels.
- 4 fire hoes.
- 4 slice bars.
- 2 lazy-bars.
- 1 clinker-rake.
- 1 bench.
- 1 wardrobe.
- 1 steam damper regulator
- 1 clock.
- 5 feet of 1 inch hose.
- 2 water pails.

- 1 broom.
- 2 ladders.
- 1 portable forge.
- 1 anvil.
- 1 sledge-hammer.
- 1 blacksmith hand hammer.
- 1 coal-breaker hand hammer.
- 2 pairs tongs.
- 1 blacksmith's chisel.

IN COAL ROOM.

300,956 pounds coal and dust.

- 1 coal screen.
- 3 barrels fire sand.
- 2 coal buckets.
- 1 coal car transmitter.

IN STORE ROOM—(Main Building).

- 2 sets pipe-stocks.
- 1 set pipe-dies $\frac{1}{4}$ to 2 inch.
- 1 set pipe-taps $\frac{1}{4}$ to 2 inch.
- 1 set pipe-tongs $\frac{1}{4}$ to 2 inch.
- 2 pipe-cutters.
- 12 balls lamp wick.
- 2 sheets of tin.
- 1 sheet gauge 16. copper.
- $\frac{1}{2}$ keg 8-penny nails.
- 50 washers $\frac{1}{2}$ inch to 1 inch.
- 1 man-hole pattern and cross-heads.
- 1 hand-hole pattern and cross-heads.
- 1 patent oil can.
- 1 bolt extractor.
- 1 ratchet.
- 5 drills.
- 2 jack-screws.
- 3 machinists' taps.

- 17 cold-chisels.
- 1 differential chain-tackle.
- 2 tube cleaners.
- 1 window brush.
- 6 pounds marline.
- 7 socket-wrenches.
- 13 open wrenches.
- 2 box wrenches.
- 13 eye-bolts.
- 150 feet inch rubber hose.
- 25 valve cages and seats for water cylinders.
- 3 steel bars.
- 8 pounds asbestos packing.
- 20 pounds Tuck packing.
- 2 speed regulators.
- 1 hand bellows.
- 4 hand lanterns.
- 4 packing hooks.
- 33 bolts $\frac{1}{2}$ to 1 inch.
- 3 steel set bolts for steam piston.
- 75 pipe fittings, assorted sizes and kinds.
- 16 lengths gas pipe $\frac{1}{4}$ to 2 inch.

IN COAL HOIST ENGINE BUILDING.

- 1 hoisting engine.
- 1 hoisting rope.

IN STORE HOUSE—(West of Main Building).

- 1 vertical portable engine and equipments.
- 1 windlass.
- $\frac{1}{2}$ bale of waste.
- 500 fire brick.
- 2 barrels kaolin.
- 2 pairs blocks and tackle.
- 7 slings.
- 1 lawn mower.
- 2 garden rakes.

- 1 scythe.
- 1 grass cutter.
- 7 gallons kerosene oil.
- 2 barrels Rosendale cement.
- 3 barrels of lime.

ON THE GROUNDS OUTSIDE.

- 1 24-inch sleeve.
- 1 Y 24x30.
- 1 length 24-inch pipe.
- 1 piece 4-inch pipe 4 feet long.
- 4 6-inch tile pipe.
- 1 12-inch tile pipe.
- 8 wooden horses.
- 1 ladder.
- 2 cast iron plates for fire room.
- 1 ½ cords hemlock wood.
- 8 2x10 spruce plank.
- 8,000 pounds old cast iron scrap.

Respectfully submitted,

| | | |
|--|---|---------------------------------|
| RICHARD F. HALL, JOSEPH FALES, LYMAN R. AVERY, JOHN B. PIERSON, DAVID M. RANKEN, | } | <i>Water Commissioners.</i> |
|--|---|---------------------------------|

WATER COMMISSIONERS' OFFICE,
TROY, N. Y., March, 1885.

ORDINANCE

IN RELATION TO THE WATER WORKS OF THE CITY OF TROY.

PASSED MAY 7th, 1885.

The City of Troy, in Common Council convened, ordains as follows :

SECTION 1. It shall be unlawful for any person or persons to open any fire plug appurtenant to the water works of said city, or to draw water therefrom, excepting the water commissioners and persons under their direction or with their permission, and the chief engineer of the fire department, and the members of a fire engine or hose company, under his direction, and for the purpose of extinguishing fire or for cleaning their engines or hose, or for the purpose of making trials of their engines at a meeting of the company having charge of such engine, which trials must be had under the immediate supervision of the chief engineer or one of his assistants.

SEC. 2. It shall be unlawful for any person or persons upon whose premises a regular annual water rent shall be assessed, or who shall duly take water by special rates, for the use of his, her or their dwelling house, store or premises, to let the water run from his, her or their hydrants unnecessarily to waste, or to make use of it, or allow it to be used for any other purpose than that for which it was assessed or duly taken. This section shall not be construed to prevent such takers from using the water with a brush or broom to wash their windows, stoop or sidewalk.

SEC. 3. It shall be unlawful for any person or persons upon whose premises a regular water rate shall be assessed, or who shall duly take water by special rates, to make or allow to be made any addition or alteration whatever in or about any conduit pipe or stop-cock on such premises, unless the same be made by the permission and under the direction of the said superintendent.

SEC. 4. All persons upon whose premises a regular water rate is assessed, or who shall duly take water by special rates, shall, at all reasonable times, permit the superintendent of said water works, and all persons employed by him or by the water commissioners, to enter in and upon such premises to examine the pipes and apparatus thereon, and the manner in which water is used on such premises.

SEC. 5. It shall be unlawful for any person or persons, except the said superintendent and those employed by him or by the water commissioners, to tap or make any connection with the main or distributing pipes of said water works, or to permit the same to be done, except as aforesaid.

SEC. 6. It shall be unlawful for any person or persons to fish in the water works lakes or reservoirs, in said city of Troy, or in the town of Brunswick, or in either of said lakes or reservoirs, with hook, net or in any other manner, or throw into or upon the waters of said reservoirs, or lakes, or either of them, any stones, wood or other substance, and it shall be unlawful for any person or persons to enter or remain upon the lands or waters belonging to the city of Troy and used in connection with the water works system, without the permission of the water works commissioners or their authorized agents.

SEC. 7. It shall be unlawful for any person or persons upon whose premises a regular water rate is assessed, or who shall duly take water by special rates, after the water has been shut off from such premises for cause, to let on the

water, or to let the water run from his, her or their hydrants, or to authorize, cause, suffer or permit the water to be let on, except the same be done by or under the direction of said superintendent.

SEC. 8. It shall be unlawful for any person or persons not residing in or occupying the dwelling house, store or premises for the use of which a water rate is regularly assessed, or water is duly taken, to draw, use or take away water from any hydrant on such premises, without the consent of the owner or owners thereof.

SEC. 9. It shall be unlawful for any person or persons, in paving or relaying sidewalks, to pave over and conceal the stop-cock boxes attached to laterals, but in every instance where it is desired to raise the grade of a sidewalk above the top of the stop-cock boxes, notice shall be given by the owner of the premises to the superintendent of the water works, in order that he may lengthen out the stop-cock box to conform to the new grade.

SEC. 10. It shall be unlawful for any person or persons to place or deposit any building material, rubbish, or any other obstruction in front of any of the city fire plugs so as to prevent ready access to the same by the fire department.

SEC. 11. Every person who shall violate any of the provisions, conditions or prohibitions in this ordinance contained, shall upon conviction thereof by and before the police magistrate of the city of Troy, be punished for each and every such offence, by a fine not less than \$5 nor exceeding \$25, or by imprisonment in the common jail of the county of Rensselaer for a period not less than three days nor more than ten days, or by both such fine and imprisonment in the discretion of such magistrate.

SEC. 12. All ordinances heretofore passed by this board in relation to the Troy Water Works are hereby repealed ;

but such repeal shall not in any manner affect any penalty already incurred under said ordinances, or any action commenced for the violation of said ordinances.

SEC. 13. This ordinance shall take effect immediately.

BY-LAWS AND REGULATIONS

For the protection, preservation and maintenance of the Water Works, and the use and control of the water supplied under the act of the Legislature, entitled "An Act in relation to the Troy Water Works," passed March 9, 1855, made by the Water Commissioners of said city, and approved by the Common Council thereof, according to the provisions of said act, on the 7th day of May, 1885.

1. The regular annual rates of water rents shall begin on the first day of May in each year, and all special rates shall be paid in advance for a term not exceeding one year.

2. All persons taking water must pay the expense of their own pipes, fixtures and apparatus, and also of the lateral leading from the main in the street, and must keep the same in good repair, and protected from the frost, at their own risk and expense, and shall prevent all unnecessary waste of water.

3. The commissioners will repair the main pipes in the streets, and the valves and fire-plugs connected therewith or attached thereto, within a reasonable time after learning or being notified of any defect or break therein. They reserve to themselves the control of all stop-cocks on mains; they also reserve the right whenever they, or the superintendent, deem it proper, or whenever there is a violation of the rules and regulations of the Department, to take charge of and control the stop-cocks on laterals. They will not be accountable for any break or obstruction caused by frost or otherwise, or for damage arising by leakage from laterals, fixtures and pipes owned by individuals.

4. All applications to the Water Department for new work or for repairs must be made by the owner of the pre-

mises or his authorized agent, in writing and on blanks furnished for that purpose by the Board, and all persons having work done or material furnished by the Water Department must pay ready cash for the same; in default thereof the superintendent shall shut off the water until the same be paid, together with the expense of shutting it off and letting it on again.

5. Owners or occupants of buildings, using water for purposes other than those for which the regular annual rent shall be assessed on such buildings, shall pay for such extra use such special rate as the commissioners shall designate.

6. In case of fraudulent misrepresentation on the part of the applicant for extra use of water, or of uses not embraced in his application, or of wilful and unreasonable waste of water, the commissioners shall have the right to forfeit his payment and stop the supply of water.

7. All damages caused by the neglect of the owners or occupants of buildings to keep their laterals, pipes, fixtures and apparatus in good order, must be paid for by them.

8. The commissioners reserve the privilege, in cases of severe drought, or in case of the supply of water being short, of shutting off the water from all places where the supply is made by special rate, and in other cases, where, in the judgment of the commissioners, the supply for the time being can be suspended, by refunding to the owners or occupants what money may have been paid, in proportion to the time the water shall be cut off.

9. No hydrant shall be permitted in the street, on the sidewalk, or in the front area of any house or building, except temporarily for the use of masons in erecting buildings, or for any other needful special purpose.

10. Non-compliance with either of these regulations on the part of any taker of water, shall authorize the commissioners, by their agents, to cause the water to be stopped

from passing to such taker, the lateral to be cut off from the main, and to retain the money which may have been paid in advance for any special rate.

11. Whenever the superintendent shall shut off the supply of water, pursuant to these regulations, he may restore the same upon the offender conforming to his directions in the matter, and paying all the expenses incurred. When any person shall feel aggrieved by the shutting off of water, or for any other cause, he may appeal to the commissioners, who shall finally determine the matter.

Adopted April 16, 1885, by Board of Water Commissioners of the city of Troy.

REPORT
OF
P. H. BAERMANN,
CHIEF ENGINEER,
TROY WATER WORKS.

R. F. Hall, Esq., President of the Board of Water Commissioners :

SIR : In compliance with the instructions of the Board, the following report of the operations of the pumping system for the year ending February 28, 1885, is respectfully submitted.

THE PUMPING SERVICE.

The accompanying tables show in detail the operations of the machinery and boilers, the cost of the various items of labor, coal, gas, etc., and the annual expenditure.

ENGINE RECORD FOR THE YEAR ENDING FEB. 28, 1885. TWO SETS OF HOLLY "QUADRUPLEX" ENGINES.

| MONTHS. | Number of days pump- ing engine No. 1. | Number of days pump- ing engine No. 2. | Total days pumping. | Average pumping time. H. M. | Total revolutions per month. | Average per minute. | COAL. | | | Ashes, per cent. | Gallons pumped month, deduction of 4 per cent. for loss of ac- tion. | Average No of gallons pumped per 1 lb. coal. | Average No of gallons raised 100 feet per 1 lb. coal. | Average head against Pumps. | Duty in lbs. of water raised 1 ft. high per 100 lbs. coal—calculated on total coal. |
|------------------------|---|---|---------------------|--------------------------------|---------------------------------|---------------------|-----------|-----------|-----------|------------------|---|---|---|--------------------------------|--|
| | | | | | | | Starting. | Pumping. | TOTAL. | | | | | | |
| March | 11 | ... | 11 | 17.31 | 160,458 | 13.8 | 24,950 | 183,000 | 207,950 | 21.21 | 46,519.984 | 223 | 541.3 | 242 | 45,090.290 |
| April | 12 | ... | 12 | 16.12 | 173,664 | 14.7 | 47,275 | 171,450 | 218,725 | 17.73 | 50,348.667 | 230 | 556.6 | 242 | 46,364.780 |
| May | 30 | ... | 30 | 19.16 | 520,021 | 15.0 | 49,620 | 519,175 | 568,795 | 18.28 | 150,764.488 | 265 | 641.2 | 242 | 53,411.960 |
| June | 10 | 18 | 28 | 20.48 | 525,289 | 15.0 | 15,710 | 529,755 | 545,465 | 19.86 | 152,201.786 | 279 | 675.2 | 242 | 56,244.160 |
| July | 14 | 16 | 30 | 23.03 | 639,795 | 15.4 | 5,700 | 631,756 | 637,456 | 21.47 | 185,489.367 | 290 | 701.8 | 242 | 58,459.940 |
| August | 9 | 20 | 29 | 21.45 | 588,168 | 15.5 | 12,775 | 570,558 | 583,633 | 21.84 | 170,521.667 | 292 | 706.6 | 242 | 58,859.780 |
| September | ... | 24 | 24 | 21.54 | 510,437 | 16.2 | 13,418 | 486,579 | 499,997 | 18.78 | 147,985.896 | 296 | 716.3 | 242 | 59,667.790 |
| October | 21 | 6 | 27 | 21.36 | 555,480 | 15.8 | 9,776 | 546,915 | 556,691 | 17.94 | 161,044.762 | 289 | 699.4 | 242 | 58,260.020 |
| November | 30 | ... | 30 | 21.46 | 628,554 | 16.0 | 20,086 | 633,991 | 654,077 | 20.10 | 182,230.376 | 273 | 660.6 | 242 | 55,027.980 |
| December | 6 | 22 | 28 | 22.49 | 573,462 | 15.4 | 15,367 | 579,351 | 594,718 | 16.59 | 166,258.103 | 279 | 675.2 | 242 | 56,244.160 |
| 1885—January | 8 | 23 | 31 | 21.15 | 601,533 | 15.2 | 17,508 | 611,372 | 628,880 | 17.27 | 174,396.448 | 277 | 670.3 | 242 | 55,835.990 |
| " February | 24 | 4 | 28 | 23.47 | 618,914 | 15.4 | 1,750 | 643,651 | 645,401 | 17.30 | 179,153.305 | 273 | 660.6 | 242 | 55,957.232 |
| 1884. Total & Averages | 175 | 133 | 308 | 20.58 | 6,095,775 | 15.3 | 233,935 | 6,107,853 | 6,341,788 | 19.03 | 1,767,004.849 | 272 | 658.7 | 242 | 54,952.007 |
| " for 1883 | 172 | 161 | 333 | 14.43 | 4,599,981 | 15.6 | 701,940 | 4,230,786 | 4,932,726 | 18.8 | 1,333,626.492 | 270 | 653.4 | 242 | 54,428.220 |
| " for 1882 | 91 | 161 | 252 | 13.47 | 3,239,261 | 15.5 | 601,878 | 3,014,271 | 3,616,149 | 18.6 | 943,562.395 | 260 | 629.2 | 242 | 53,036.527 |
| " for 1881 | 159 | 176 | 335 | 13.35 | 4,175,129 | 15.3 | 778,810 | 4,018,420 | 4,779,230 | 18.8 | 1,210,044.908 | 252 | 609.8 | 242 | 50,799.672 |

Boilers 1, 2 and 3 were under steam 166 days, and boilers 4, 5 and 6 were under steam 147 days, a total of 313 days, as against 333 days in 1883.

Engine No. 1 was in operation 175 days, during an average of 20 hours 58 minutes per day, raising during that time 959,349,062 gallons of water; or an average of 5,481,994 gallons for each day the engine was in operation.

Engine No. 2 was in operation 133 days for an average of 20 hours and 58 minutes each day, raising during that time 807,655,784 gallons of water; or an average of 6,072,599 gallons for each day the engine was in operation.

Taken as a whole, the pumping machinery was in operation on 308 days during an aggregate of 6,457 hours and 44 minutes, an average of 20 hours and 58 minutes each day, and raised 1,767,004,842 gallons of water; or an average of 5,976,071 gallons per day for each day the machinery was in operation. The above is equivalent to raising 5,042,822 gallons 231 feet into lower Oakwood in 18 hours and 5 minutes of each day of the year.

NOTE.—Calculations based upon displacements of pumps (30,248 U. S. gallons per revolution), less 4 per cent. for loss of action:

OPERATING EXPENSES FOR THE YEAR ENDING FEB. 28, 1885.

97

| MONTHS. | COAL. | | Engineers, Firemen and Laborers. | REPAIRS. | SUPPLIES. | GAS. | Tele- phone. | Engineer- ing. | TOTAL. |
|------------|-----------|---------|--|------------|-----------|----------|-----------------|-------------------|--------------|
| | Tons. | Per Ton | | | | | | | |
| Mar., 1884 | 92.835 | \$4 36 | \$ | \$ 248 74 | \$ 54 72 | \$ 28 80 | \$ 6 92 | \$ 83 33 | \$ 1,386 94* |
| April..... | 97.645 | 4 36 | | 40 48 | 174 12 | 17 40 | 6 92 | 83 33 | 1,345 71 |
| May ... } | 148.800 | 4 36 | | | | | | | |
| | 17.72 | 5 00 | | | | | | | |
| | 87.406 | 4 12 | | 167 25 | | 41 40 | 6 92 | 83 33 | 1,966 71 |
| June | 243.511 | 4 12 | | | | | | | |
| | 243.511 | 4 12 | | 143 05 | 7 20 | 52 80 | 6 92 | 83 33 | 1,907 80 |
| July | 275.177 | 4 12 | | 255 07 | 56 13 | 73 80 | 6 92 | 83 33 | 2,204 38 |
| August ... | 260.55 | 4 12 | | | 91 52 | 40 58 | 6 92 | 83 34 | 1,918 54* |
| | 146.532 | 4 35 | | | | | | | |
| Septem. } | 76.681 | 4 12 | | 467 24 | 225 65 | 59 02 | 6 93 | 83 34 | 2,401 68 |
| | 109.304 | 4 60 | | | | | | | |
| October } | 130.195 | 4 35 | | | | | | | |
| | 9.024 | 5 00 | | 1,133 98 | 21 00 | 72 54 | 6 93 | 83 34 | 3,040 31* |
| November | 296.909 | 4 35 | | | | | | | |
| | 296.909 | 4 35 | | 1,751 55 | 25 50 | 88 14 | 6 93 | 83 33 | 3,877 91 |
| December | 265.499 | 4 35 | | 4,043 26 | 109 84 | 88 40 | 6 93 | 83 33 | 6,085 62 |
| Jan., 1885 | 280.754 | 4 35 | | 2 15 | | 99 84 | 6 93 | 83 34 | 2,007 14 |
| | 230.900 | 4 35 | | | | | | | |
| | 33.40 | 4 85 | | 795 04 | 56 44 | 86 75 | 6 93 | | 2,719 75 |
| Febru'y } | 23.80 | 1 25 | | | | | | | |
| | 2,916.642 | | | \$9,047 81 | \$822 12 | \$749 47 | \$83 10 | \$916 67 | \$30,862 49 |

* Including \$22 for wood.

The actual cost of operating the pumping works during the year ending February 28, 1885, was \$30,862.09, distributed as follows :

| | |
|----------------------------|--------------------|
| Cost of Coal and Wood..... | \$12,135.97. |
| “ Labor..... | 7,106.95 |
| “ Repairs..... | 9,047.81 |
| “ Supplies..... | 822.12 |
| “ Engineering..... | 916.67 |
| “ Gas..... | 749.47 |
| “ Telephone..... | 83.10 |
| Total..... | <u>\$30,862.09</u> |

This unusually large expenditure is wholly due to the extraordinary repairs of the year, requiring the resetting of the three north boilers.

The constant repair to the settings of these as well as the south battery of boilers, has formed the larger portion of the items of “repairs” for the last four years, and during the present year they had become absolutely unsafe. On May 6th, and August 11th, the failure of the brick work necessitated the drawing of the fires.

The resetting of the boilers, as a matter of necessity being decided upon, a careful and somewhat extended examination was made with the object of substituting for the old setting, one which, by burning cheaper coal or dust, would reduce the cost if not the quantity of coal consumed.

As the result of such examination, and under proper guarantee the Jarvis patent boiler setting was introduced. The peculiarity of this furnace consists in the setting, whereby air is admitted by small flues in the front and then conducted through a number of horizontal expanding ducts in which it traverses backward and forward until it finally, and in a heated state, enters by the bridge-wall and sides of the furnace in jets through fire-brick plates, uniting with the products of combustion and causing consumption of the gases.

The economy claimed for the Jarvis setting over the old way, is the fact that it will burn all kinds of cheap fuel

without the use of a blower, that is, anthracite coal screenings (with a mixture of bituminous), bituminous slack coal, pea coal, wet peat, saw dust, etc.

To prevent great loss, by allowing a combustible gas such as carbonic oxide, to escape unconsumed, numerous devices have been suggested for supplying the furnace with heated air above the fire, and thus effecting combustion in the furnace before the gases have time to escape.*

To accomplish this result is the object of the peculiar way of setting the brick-work, which is so built that what is required by the fire in addition to the air through the grate, is furnished in hot air discharged on top of the fire to mix with the gases generated on the grate.

The following is the result of a test of the Jarvis setting using bituminous coal and coal dust :

RECORD OF THE TEST OF THE JARVIS BOILER SETTING, BEGINNING
MONDAY, FEBRUARY 9TH, AT 10.30 A. M., ENGINE NO. 1.

| Date. | Hours, Min. | Bitumin- ous Coal, Lbs. | Coal Dust, Lbs. | Revolu- tions. | Gallons of Water Pumped. | Ashes, Lbs. |
|---------------|----------------|-------------------------------|-----------------------|-------------------|--------------------------------|----------------|
| | h. m. | | | | | |
| Monday..... | 13.30 | 3,575 | 10,525 | 9,556 | 2,285,912 | 1,130 |
| Tuesday..... | 23.47 | 8,250 | 15,900 | 19,764 | 5,968,728 | 4,005 |
| Wednesday.... | 24 | 9,000 | 17,700 | 23,588 | 7,123,576 | 3,500 |
| Thursday..... | 24 | 9,300 | 18,600 | 24,726 | 7,467,252 | 5,535 |
| Friday..... | 24 | 8,900 | 17,400 | 23,521 | 7,101,342 | 3,450 |
| Saturday..... | 24 | 8,100 | 16,200 | 22,148 | 6,688,696 | 5,390 |
| Sunday..... | 24 | 8,700 | 17,400 | 23,142 | 6,988,884 | 3,600 |
| Monday..... | 10.30 | 4,500 | 8,400 | 9,941 | 3,002,182 | 2,040 |
| | | 60,325 | 122,125 | | 46,626,572 | 28,650 |

Total Coal, 182,450 lbs. Ash, 15.1 per cent.

| | |
|-------------------------|----------|
| 26.9 tons @ \$4.85..... | \$130.46 |
| 54.5 tons @ 1.25..... | 68.30 |
| 81.4 tons, cost..... | \$198.76 |

Raising 46.6 million gallons into the reservoir at a cost
in coal alone of..... \$4.27 per million.

*Wm. M. Barr, Engineer's Club of Cleveland.

| | | |
|---|--------|--------------|
| The average cost in coal in the year 1881, was..... | \$7.83 | per million. |
| “ “ “ “ 1882, “ | 7.45 | “ |
| “ “ “ “ 1883, “ | 7.33 | “ |
| “ “ “ “ 1884, “ | 6.83 | “ |

A mean cost of coal per million gallons raised into the reservoir of \$7.36. The saving shown by this test in the cost of coal, if maintained for an entire year, would show a coal account of \$7,545.09 in place of \$12,069.97, a gain of \$4,524.88.

Another noticeable feature of the test is the reduction in ash from a yearly average of 19.03 to 15.1 per cent. of the total coal consumption.

A comparison is here made of the old settings using Lackawanna coal.

ENGINE NO. 1, BEGINNING FEBRUARY 1ST, 1885.

| Date. | Hours Run. | Lackawanna Coal Lbs. | Ash. Lbs. | Gallons of Water Pumped. |
|-----------------|------------|----------------------|-----------|--------------------------|
| Sunday. | 24.00 | 22,822 | 4,585 | 6,681,750 |
| Monday..... | 23.14 | 23,115 | 4,271 | 6,559,742 |
| Tuesday..... | 24.00 | 22,529 | 4,405 | 6,811,308 |
| Wednesday | 24.00 | 22,529 | 4,695 | 6,795,302 |
| Thursday..... | 24.00 | 22,822 | 4,695 | 6,682,656 |
| Friday..... | 24.00 | 21,943 | 4,065 | 5,736,118 |
| Saturday | 24.00 | 21,943 | 3,780 | 5,916,214 |
| | | 157,703 | 30,496 | 45,183,160 |

Total Coal, 157,703 lbs. Ash, 19.3 per cent.

70.4 tons at \$4.35, \$306.24, raising 45,183 million gallons into the reservoir at a cost in coal alone of \$6.77 per million.

It is manifestly improper to charge the large expense of resetting three boilers to the present year's pumping; this repair is in the nature of a renewal and should be considered as a part of construction account. Deducting the cost of this work, which includes in addition to the setting, new iron fronts, iron floor plates and new pipe connections,

viz: \$8,195.07 from the "repairs," we have as the proper operating expenses of the year, \$22,667.42, divided as follows:

| | | |
|----------------------------|--------------------|------------------------|
| Cost of Coal and Wood..... | \$12,135.97... | 53.3 per cent. |
| " Labor..... | 7,106.95..... | 31.7 " |
| " Repairs..... | 852.74..... | 3.8 " |
| " Supplies..... | 822.12..... | 3.6 " |
| " Engineering..... | 916.67. | 4.0 " |
| " Gas..... | 749.47..... | 3.3 " |
| " elephone..... | 83.10..... | 0.3 " |
| Total..... | <u>\$22,667.42</u> | <u>100.0 per cent.</u> |

As a matter of interest, in connection with the subject of the expense of the water supply, the percentage which the above several items have constituted of the entire cost of each year since the pumping machinery has been in operation, is presented in the following:

TABLE.

| ITEMS OF COST. | PER CENT. OF THE TOTAL COST. | | | | MEANS OF 4 YEARS. |
|------------------|---------------------------------|-------|-------|-------|-------------------------|
| | 1881. | 1882. | 1883. | 1884. | |
| Fuel..... | 53.6 | 48.1 | 53.6 | 53.3 | 52.15 |
| Labor..... | 24.9 | 32.0 | 28.7 | 31.7 | 29.32 |
| Supplies..... | 7.9 | 6.0 | 5.7 | 3.6 | 5.80 |
| Engineering..... | 5.4 | 3.8 | 4.3 | 4.0 | 4.37 |
| Repairs..... | 5.0 | 7.5 | 4.7 | 3.8 | 5.25 |
| Gas..... | 2.0 | 2.0 | 1.8 | 3.3 | 2.27 |
| Telephone..... | 1.2 | 0.6 | 1.2 | 0.3 | .84 |
| | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

The item of "repairs" for the last four years has been as follows:

| | |
|------------|--------------------|
| 1881..... | \$ 920.50 |
| 1882..... | 1,166.25 |
| 1883..... | 902.12 |
| 1884..... | 9,047.81 |
| Total..... | <u>\$12,036.68</u> |

From the quantity of water pumped during the year, and the cost of the service, may be deduced the following :

| | |
|--|---------|
| Cost per million gallons raised 231 ft. | \$12.82 |
| “ “ “ 1 ft. | .0555 |

The following exhibits these costs for each year while the machinery has been in operation.

| | 1881 | 1882. | 1883. | 1884. |
|--|-----------|-----------|-----------|-----------|
| Annual operating expenses..... | 18,530 83 | 15,239.11 | 19,013.97 | 22,667.42 |
| Cost per million gallons raised 231 feet high..... | 15.20 | 16.12 | 14.24 | 12.82 |
| Cost per million gallons raised one foot high..... | .0658 | .0697 | .0616 | .0555 |

It is a subject of some congratulation that the cost per million gallons has this year been reduced to the figures above given, which is 24 cents below the Engineer's estimate, which would have allowed for the amount of water pumped this year, \$23,087.02, while the actual proper cost was \$22,667.42.

The operations of the machinery during the year have been satisfactory. There have been no serious breaks, the principal work at the station being the resetting of the three north boilers. The Committee on Pumping Station have given a great deal of attention to the works, and to this cause, aided by the intelligence and care of the engineer and assistants at the station, the results obtained are due.

GALLONS OF WATER PUMPED.

| MONTHS. | 1880. | | 1881. | | 1882. | | 1883. | | 1884. | |
|---|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
| | Gallons Pumped. | Rain fall in in. | Gallons Pumped. | Rain fall in in. | Gallons Pumped. | Rain fall in in. | Gallons Pumped. | Rain fall in in. | Gallons Pumped. | Rain fall in in. |
| March..... | ..... | ..... | 81,118,877 | 3.80 | 1,760,974 | 1.79 | 72,720,226 | 1.77 | 46,519,984 | ..... |
| April..... | ..... | ..... | 94,319,325 | 1.34 | 90,127,863 | 1.27 | 90,179,466 | 2.65 | 50,348,667 | ..... |
| May..... | ..... | ..... | 105,215,429 | 3.90 | 75,313,386 | 4.15 | 106,645,065 | 3.20 | 150,764,488 | ..... |
| June..... | ..... | ..... | 118,278,663 | 3.76 | 47,717,933 | 3.98 | 106,609,838 | 6.30 | 152,291,786 | ..... |
| July..... | ..... | ..... | 109,138,502 | 2.22 | 33,399,074 | 3.97 | 111,602,385 | 5.96 | 185,489,367 | ..... |
| August..... | ..... | ..... | 111,235,734 | 2.07 | 106,645,912 | 1.38 | 124,168,098 | 3.69 | 170,521,667 | ..... |
| September..... | ..... | 2.88 | 113,483,386 | 2.38 | 92,967,196 | 7.79 | 112,563,180 | 3.19 | 147,985,896 | ..... |
| October..... | ..... | 2.43 | 108,152,337 | 3.19 | 101,775,616 | .27 | 109,502,784 | 3.49 | 161,044,762 | ..... |
| November..... | 80,553,693 | 2.49 | 118,263,587 | 3.44 | 104,251,002 | .97 | 112,972,525 | 1.14 | 182,230,376 | ..... |
| December..... | 93,431,378 | 1.99 | 101,340,957 | 4.88 | 108,361,019 | 2.24 | 137,686,777 | 2.55 | 166,258,103 | ..... |
| January..... | 124,891,709 | 2.02 | 88,902,709 | 2.64 | 107,415,475 | 2.43 | 159,750,269 | 2.98 | 174,396,448 | ..... |
| February..... | 94,556,445 | 2.81 | 60,532,107 | 3.31 | 73,835,942 | 3.00 | 89,504,973 | 3.85 | 179,153,305 | ..... |
| Total..... | 393,433,225 | ..... | 1,210,044,908 | 36.93 | 943,562,395 | 33.24 | 1,333,626,492 | 40.77 | 1,767,004,849 | ..... |
| For each and every day in year. For each day that the pumps were in operation. | | | | | | | | | | |
| Averages. | 1,077,899 | ..... | 3,315,191 | ..... | 2,585,102 | ..... | 3,653,771 | ..... | 4,841,109 | ..... |
| | 3,783,011 | ..... | 3,620,074 | ..... | 3,744,295 | ..... | 4,004,884 | ..... | 5,737,028 | ..... |

The amount of water pumped since the starting of the log, the rain-fall for each month, and the average pumpage for each month, is shown in the table of "gallons of water pumped."

The average daily pumpage when the machinery was in operation shows the following rate of increase :

| | |
|-------------------|---------------|
| 1882 over 1881 of | 3.3 per cent. |
| 1883 " 1882 of | 6.7 " " |
| 1884 " 1883 of | 29.9 " " |

The last year being unduly large in consequence of the change from a head of 105 to 202 feet upon the lower service.

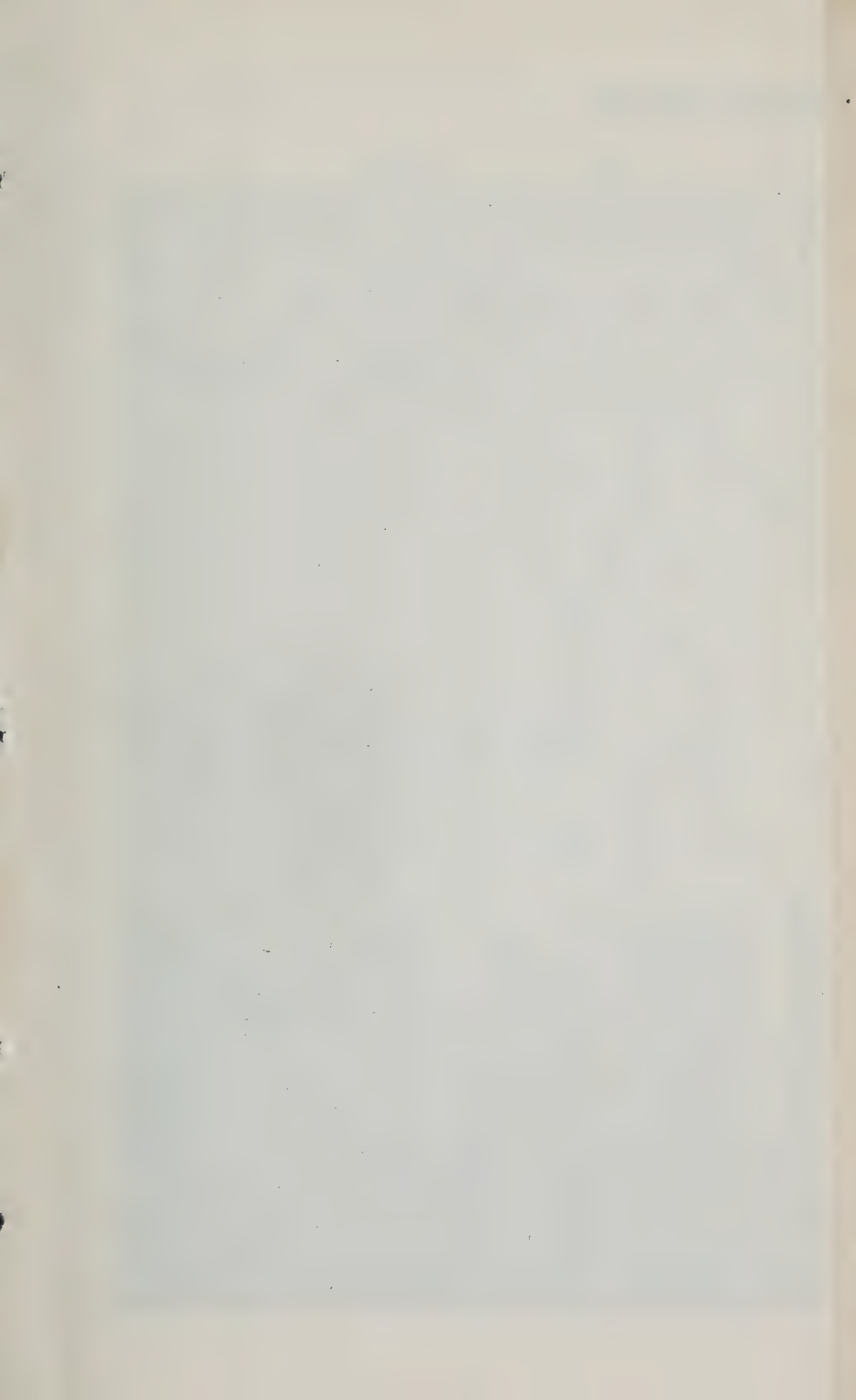
The capacity of the Pumping works as stated in the report of 1882, is a continuous run of one set of machinery ; for, with the very limited storage capacity on the low service it would be dangerous to depend on both engines operating at the same time. Were this storage sufficient to provide a supply in case of accident to either engine, we might count our pumping capacity greater than one set, and as such is not the case provision must be made in the near future for additional machinery. Taking the capacity of one set of machinery at 7 million gallons per day, for 365 days, we find as follows :

| | |
|-----------------------------|--------------------------------------|
| In 1881 the pumpage equaled | 47 per cent. of the total capacity ; |
| In 1882 " " " | 36 " " " " |
| In 1883 " " " | 52 " " " " |
| In 1884 " " " | 69 " " " " |

While the pumpage in July reached 87 per cent. of the total capacity.

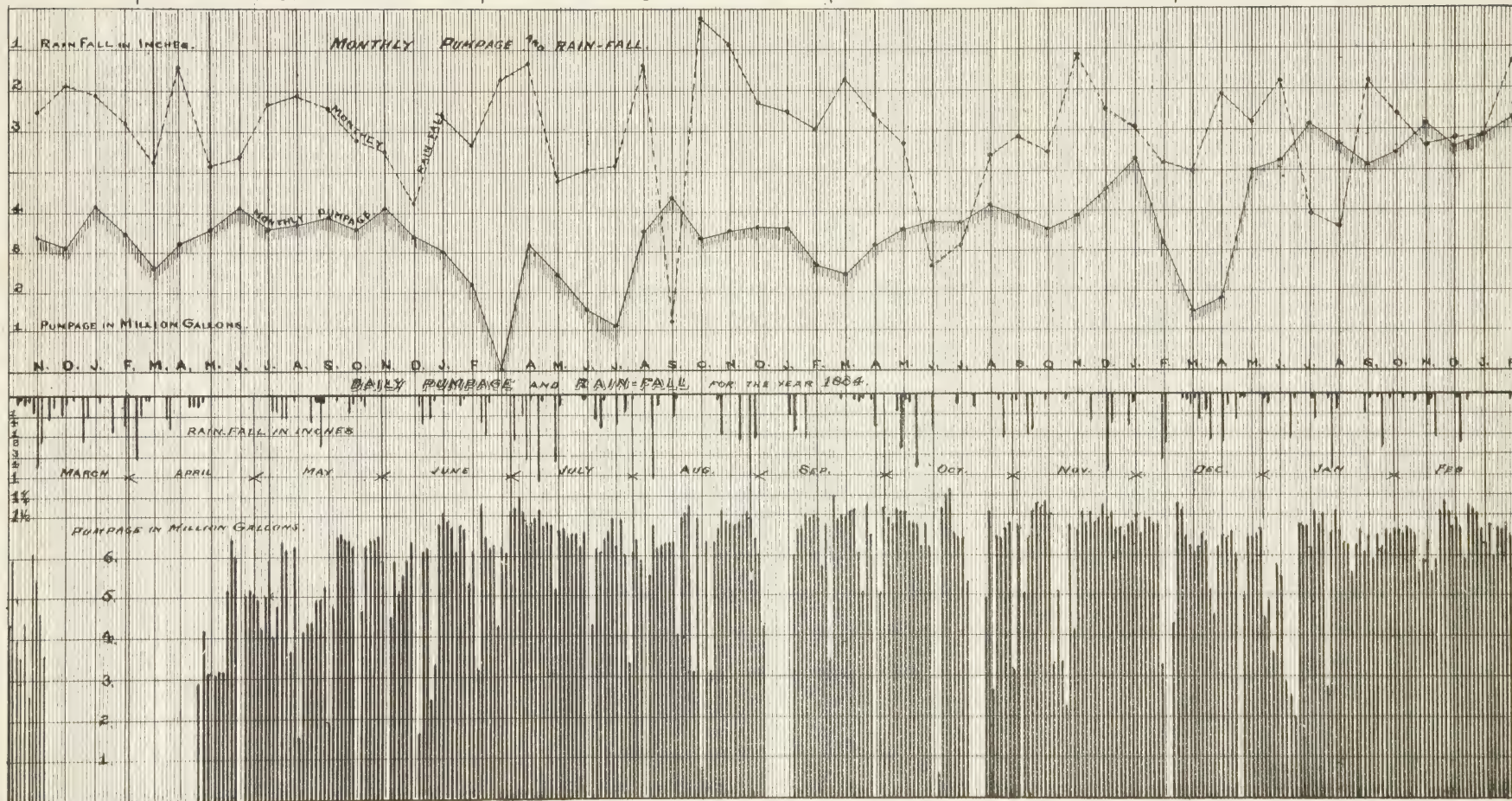
It appears evident that during the coming season the capacity of the pumping works will be reached in certain months, and provision must be made to meet the demands.

This alarming increase in the consumption of water can be attributable to but one cause, and that is waste, wilful



TROY WATER-WORKS.

1884



and unnecessary waste.* Its importance in regard to increased annual cost of the pumping service, and to the increased pumping capacity of the machinery cannot be over estimated, and the same question that has presented itself to every large city in the country, viz. : how can the waste be reduced ? now demands solution here.

The population receiving their supply from the low service is estimated as follows (from the census of 1875) :

| | | |
|---------------|---------------------|--------------|
| 1st Ward..... | $\frac{3}{4}$ | 2,970 |
| 2d "..... | $\frac{3}{4}$ | 3,300 |
| 3d "..... | $\frac{3}{4}$ | 1,590 |
| 4th "..... | $\frac{2}{3}$ | 2,560 |
| 7th "..... | $\frac{1}{2}$ | 2,150 |
| 8th "..... | ..... | 3,710 |
| 10th "..... | $\frac{1}{2}$ | 2,500 |
| 13th "..... | ..... | 2,384 |
| 9th "..... | ..... | 4,191 |
| 12th "..... | ..... | 3,217 |
| 6th "..... | ..... | 3,983 |
| 11th "..... | ..... | 3,034—35,589 |

Applying the same rate of increase to these Wards which has obtained in the whole city, between 1875 and 1885, we have 42,706, or 71.2 per cent. of the total population.

The average daily pumpage for each day in the year was 4,841,109 gallons, and for each day the machinery operated 5,737,028 gallons. In the first case a consumption of 113 gallons per capita, and in the second a consumption of 134 gallons per capita. European cities show a consumption of from 18 to 40 gallons per person per day, and American

* This waste is shown conclusively in the accompanying graphical representation of the water pumped, the great increase from 1883 to 1884 is accounted for by the same causes of waste, under the increased pressure which was put on the low service in December, 1883.

This diagram also represents the close connection existing between the pumping and gravity supplies, and intimates when under proper circumstances, the one may be made to assist the other. The lower diagram represents the daily pumpage and rain-fall for each day of the year.

cities, where no effort has been made to prevent waste, range from 30 to 151 and even 200 gallons per day. In those cities, where the consumer pays for the quantity used, the consumption is from 30 to 40 gallons.

Providence uses 30 gallons per day, 47 per cent. of the services being metered.

Fall River, 27 gallons per day, 55 per cent. of the services being metered.

Pawtucket, 32 gallons per day, 42 per cent. of the services being metered.

St. Louis, 44 gallons per day, 70 per cent. of the services being metered.

The chief engineer of the Philadelphia works, Col. Ludlow, in his report for 1884, says:

“It may therefore be safely assumed that 40 gallons per day per head of population is ample for all purposes for which water is legitimately used, this amount being divided nearly as follows :

| | |
|-------------------------------|-------------|
| For domestic uses..... | 20 gallons. |
| Manufacturing purposes..... | 15 “ |
| Sprinkling streets, etc. | 2 “ |
| Fountains..... | 2 “ |
| Fire purposes..... | 1 “ |
| | — |
| Total..... | 40 “ |

The peculiar character of the manufacturing interest of this City being largely such as to require a great quantity of water, I should double the estimate for manufacturing purposes and add 5 gallons for the non-preventable waste due to the extreme age of about one-seventh of our entire distribution, making the legitimate quantity 60 gallons per head per day.

If this estimate is correct the legitimate use of water amounts to 44 per cent. and the waste to 56 per cent. of the total pumping.

This waste amounted last year in coal alone to \$6,795.64, but what is of still greater importance is the fact that could this waste be controlled it might save one-half the pumping,

and the extensions and additions to the machinery now necessary might be postponed for several years.

The sources of waste are divided into three classes: 1st, defective mains and services in the streets of the City; 2d, defective services and fittings on the premises of the individual; 3d, wilful waste.

The leakage from defective mains and services is but a small item of the waste. Special care is taken in laying the pipes, which are amply strong; and the general surface indications of the leaks from this cause give notice of their existence and they are soon repaired. There may be in many of the old lines of pipe extensive leaks which give no indication of their existence, finding their way unseen into the sewers, but in that portion of the distribution laid since 1856 the leakage must be slight.

Defective services and fixtures on the premises of the individual form a very large proportion of the waste. The plumbing work is under no special regulation, and repairs are only made in many instances when rendered necessary by damage to adjoining property. Laterals running through yards or under houses having no cellars may waste large quantities of water and not be known. One case in Boston of this kind was wasting 1,000 gallons per hour. The greatest source of waste was found in the Charlestown inspection (6th Annual Report Boston Water Board), to be water-closets. The district covered by this inspection contained a population of 21,760 persons, supplied by 3,170 stop-cocks. Of these 794, or 25 per cent., were found wasting water. Of the 794 cases of waste 343 were from defective water closets, and from the record of the meters the aggregate waste of twelve was nearly 50,000 gallons in 24 hours.

The wilful waste is illustrated in the above inspection where 124 water-closets were discovered through each of which there was being wasted from 100 to 300 gallons per hour.

An examination in Philadelphia of 12,000 stops showed a leakage or wastage in 3,631 cases, or over 30 per cent. of the total.

In Jersey City an examination of 993 laterals gave 553 buildings in which water was running to waste, or about 56 per cent. of the entire number of houses examined.

In Milwaukee 260 houses were examined. At 99 of these, or 38 per cent., water was found running to waste.

In all American cities where the subject has been investigated, the estimates of waste are from 25 to 75 per cent. of the total supply.

There are three principal methods of controlling or preventing this waste, viz.: House to house inspection; the application of water meters to all the service pipes; and the use of waste detectors. House to house inspection has been applied in many American cities, and if faithfully carried out can be made to furnish good results. By its use in Boston in the years 1864 and 1865 the consumption was reduced from 88 to 66 gallons per inhabitant. Cambridge by this means limits its supply to 46.7 gallons per head, of which 10 gallons are used for manufacturing purposes and street sprinkling. The system is objectionable on account of the annoyance it occasions to the consumer and its inability to detect hidden waste, and also that no check is given upon the inspection, and the amount of saving is only approximately known.

With regard to the application of water meters wherever they can be introduced at the time of the construction of the works the best results are obtained.

The third method is that most likely to give satisfactory results in the older works of the country. By the use of waste detectors and waste water meters the leak is located and its magnitude determined. The examinations are made after midnight when the streets are still, and the only inspection of premises in the day is where a leak is known to exist. The necessary inspection of houses in Charlestown was one-fourth, in Glasgow the inspection amounts to one-fifth, and in Liverpool one-tenth.

The results of determined effort in many cities of the country to control this waste is shown by the following: In Charlestown the consumption was reduced from 58.5 to

37.7 gallons, a saving of 35.6 per cent., or 20.8 gallons per person supplied, while the night rate was reduced from 37.5 to 15.8 gallons per head per day, a saving of 58 per cent. Under similar inspection Glasgow reduced the consumption from 58.8 to 38.4 gallons per day. In Cincinnati by the use of the Bell waterphone the consumption has been reduced from 87 to 66 gallons per capita, and the cost of fuel from \$75,527.63 to \$54,671.75.

As our consumption, or as it really is, waste, is double that of the above cities, it is safe to assume that we can obtain at least as good results. 35 per cent. of the yearly pumpage would be 618,451,674 gallons, which at the yearly rate of \$12.82 per million gallons, represents \$7,924.54 as the possible saving in dollars.

Briefly, then, the waste must be reduced or more pumping machinery provided. More machinery will allow of greater waste in the additional quantity furnished, while the pressure on the service will grow less and the extreme high portions of the distribution will lose even the present inadequate supply. The reduction in the waste will, in addition to reducing the expense at the Station, render the present machinery ample for five years, will increase the pressure on the present service from 15 to 20 per cent., and allow of those extensions now demanded in the lower portion of the City.

All of which is respectfully submitted.

P. H. BAERMANN,

Chief Engineer.

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